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Editor: D. B. Finn

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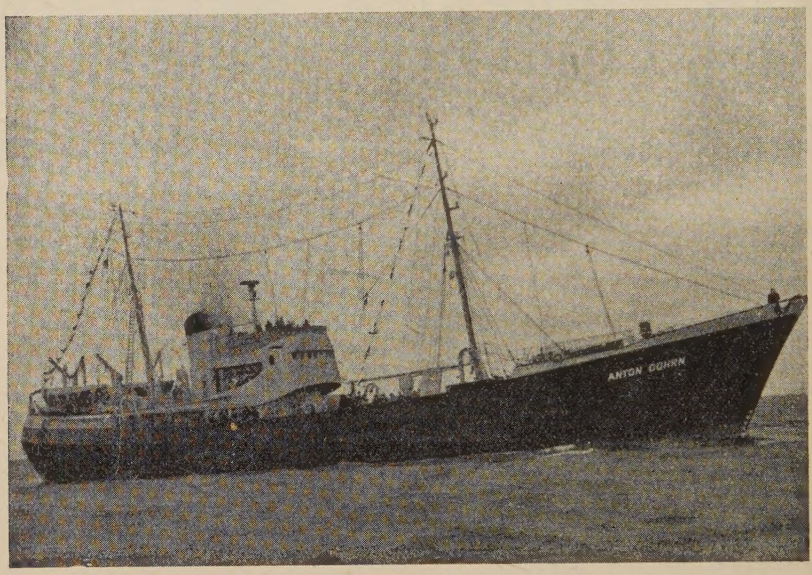
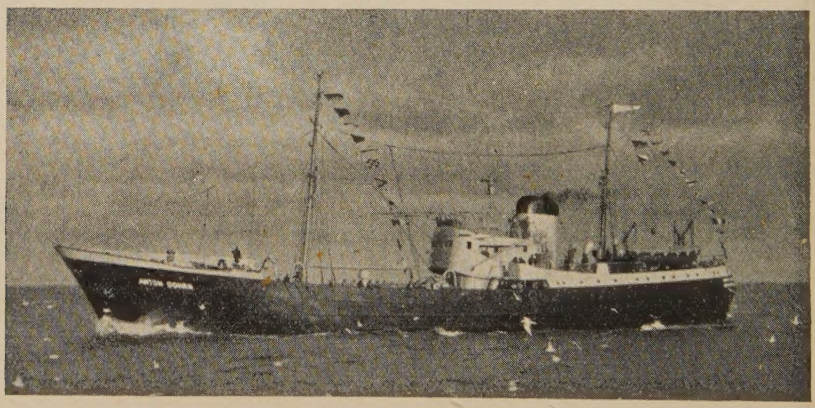
THE NEW GERMAN FISHERY RESEARCH VESSEL *ANTON DOHRN*





At the invitation of the Federal Republic of Germany, Jan-Olof Traung, FAO Naval Architect, attended the trials of the *Anton Dohrn* at Cuxhaven on 10 February 1955. The vessel has a displacement of 1,325 tons (999.02 G.R.T., 364.59 N.R.T.), is 62.3 m. (204 ft.) over-all, and 54 m. (177 ft.) between perpendiculars. She has a beam of 10.2 m. (33 ½ ft.) and a depth, including shelter deck, of 6.7 m. (22 ft.).

The *Anton Dohrn* is powered by 850 h.p. 116 r.p.m. triple expansion steam engines with exhaust steam turbines, and is equipped with laboratories for scientific work, a complete weather forecast station, a hospital with eight berths, and shops for both machine repairs and wood work. She was put into service on 3 March 1955.

THE CONTRIBUTION OF OCEANOGRAPHIC RESEARCH TO FISHERIES SCIENCE *

The contribution of oceanography to fisheries research (which means research in economic and technical fields as well as biological) is to be understood only in terms of the applied character of fisheries science. In the following paragraphs an effort is made to review the implications of this statement. However, one principal consequence should be stressed, namely, that it obliges the fisheries scientist to discriminate keenly, and frequently to scrutinize his activities to determine whether they will stand the test of their application to practical fisheries problems.

I. Some Definitions

The term 'oceanography' is taken to be a correlative of 'limnology' and thus, like that term, to comprehend the whole of the scientific work with a biological objective or of biological use bearing upon the hydrosphere. This definition derives authority from many works from among which the monumental, and already classical work, *The Oceans*, by Sverdrup, Johnson and Fleming (8), may be chosen for citation. The value of regarding oceanography as a correlative of limnology may be judged from the success of the comprehensive treatment of fresh water problems in such standard periodicals as the *Internationale Revue der gesamten Hydrobiologie und Hydrographie* (6), and the standard text by Welch (10) for which *Limnology* is the title. There appear to be no adequate reasons for the restrictions imposed upon the term by some workers, who regard it as being concerned only with physical and chemical features of the oceans, and even as the special preoccupation of naval research establishments.

Oceanography should signify the study of the oceans as water masses and of the biota which inhabit them. If not qualified, as it is in expressions such as 'fisheries biology', it is a pure science with no limitations upon the range or detail of the subject matter of its enquiry. A qualifying term, such as 'fisheries', signifies an orientation of the enquiries and a limitation of the field, rather than a specialized extension ; thus, fisheries oceanography is the investigation of the physico-chemical and biotic properties of the oceans required by fisheries science — it does not mean all the technical aspects of fisheries research. It has a correspondence to terms such as 'agricultural botany.'

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II. General Considerations

As a beginning it may be said that oceanography stands in a relationship to fisheries corresponding to that which meteorology has to agriculture. But it could also be described as the 'soil-science' of fisheries. These two aspects were discussed by Tait in his *Buckland Lectures* (9), from the points of view of physical and chemical properties of the sea, respectively, in relation to fishes. The two relationships include the more general, as well as the more particular, aspects of relations of aquatic organisms with the physical and chemical factors of their environment, as described in the now voluminous literature on ecology, as well as in classical studies of animal physiology.

Fisheries biology has the task of describing fisheries resources. Its program traverses, in a general sense, six principal phases :

1. If the area in which the biologist is working is virgin, a survey must be made to determine its general characteristics and its fish stocks ; the principal compositional features of the stocks must be described. For most of the present fishable areas, such information has been accumulated in the course of fishing operations and from work in marine biology ; a fishery biology program, which starts when the industry is already well developed, must first collate all this information.

2. The general features of the stocks of the species to be investigated must be described. The species must be correctly identified, and the continuity and taxonomic homogeneity of these stocks examined. This work may or may not require the refined taxonomic study known as racial investigation, but it is, in any case, a distribution study which must concern itself with details in the bionomics of the species.

3. The bionomics of the species must be discovered, that is, the general life history, ontogenology (embryology, growth and gerontology), including feeding, reproduction and migratory habits.

4. The composition of the stocks should be determined, and if they exist in separate units, this determination must be made for each separately. This compositional study concerns the age, sex, size, maturity and other groups, of the population.

   Such analysis generally reveals a fluctuation from year to year in composition of the stocks. Frequently, there is also considerable variation from area to area and between distinct segments of the stock. The study should seek not only to describe the composition and its fluctuation, but

also to discover the causes of these fluctuations and, if possible, to evolve a method of predicting the appearance of the fluctuations.

5. Following directly from the fourth stage, there should be a measurement of the properties of the population. These properties are potentials for growth and reproduction, and represent viability as a complement to the mortality which the stock sustains. In this stage there is effected a considerable concentration of information because, not only must data on the bionomics and composition of the stocks be reduced to expressions summarizing the consequence of these structural features, but there must also be a reference to the physiological, physical and other data concerning the factors which determine the properties of the population as a whole. This work also should aim at prediction.

6. The fisheries biologist must then collaborate with the fisheries economist and technologist in applying the general theory of fishing, to give precise expression to the relations between the properties of the population and the effect of fishing operations.

The essential feature of this program is that it is concerned with populations : its purpose is to develop an embracing description of the population as a whole and of its response to changes in the environment, including among such changes those in fishing intensity.

The fishery biologist's responsibility in respect of these populations is one of two kinds, which may be summed up in three questions. Firstly, what type of population, and where ? Secondly, of what abundance ? And, thirdly, what response to exploitation ? The first question belongs, in the main, to the exploratory stage, the second and third to the management stage. In a way, also, these questions are concerned with different kinds of abundance : those which relate to the availability of the fish to fishing operations, and those which relate to the real abundance of the stock ; these are covered respectively by the first three and the last three of the stages listed above.

In the following paragraphs a brief account is given of the role played by oceanography in assisting fisheries biology in describing fishery resources, in each of the principal divisions of its work.

III. Oceanography and the Distribution of Fish

In its broadest sense, this is marine zoogeography, but the fisheries biologist has to press his enquiry far deeper because he seeks to establish the ontogenetic distribution patterns, and, moreover, the seasonal, annual and even secular modulations, for each species of com-

mercial importance. The great oceanographic cruises of the *Challenger*, and of others since, have established the major features of our picture of marine zoogeography and yet there remains much to be done to enable us to evaluate unexploited areas in a way that will give fishermen the information they need to plan the development of fishing operations.

The zoogeographic account of the distribution of marine fauna is, in effect, a generalized one, referring to groups of species and to individual species where these characterize the fauna and serve as indicators of identified conditions. The distribution patterns, usually referred to in zoogeography, indicate the broadest limits within which the faunas are seen to occur. The more restricted limits, within which the various ontogenetic stages move, are not so important to zoogeography as they and their seasonal and other modulations are to fisheries. But the greater pattern, as well as its component parts, is the grosser manifestation of the reaction of the individual organisms to the various elements of their environment at the behest of their own physiology. The general adjustment of the organism to its medium, in respect of its respiratory and osmo-regulatory requirements, set the general limits within which it can move ; differences in these requirements, between ontogenetic stages, may give separate distributions to these stages. The nutritional requirements and peculiar needs in respect of reproductive habits further complicate the picture, as the organisms undertake feeding and reproduction migrations in search of the situations where the necessary conditions are satisfied.

It is, perhaps, no misrepresentation to say that the objects of this enquiry are, firstly, to describe the distribution of the fish and the conditions in which they are found; and, secondly, to find a means of predicting where such conditions will be found — as a means to predicting where the fish will be. It must be stressed, however, that the accurate account of distribution requires detailed elucidation of the life history of the species.

At present, we are concerned mainly with the types of fauna found in various situations, with the task of characterizing an area in respect of the composition of its fauna and, in regions where the fauna is known, with evolving means of predicting the variations in the distribution of elements of that fauna and of ontogenetic stages of those elements.

The rôle of oceanography in this phase of the program is, first, to furnish the description of the physical, chemical and biotic properties of the water masses and, in doing so, it corresponds to soil science coupled with climatology. When the distribution patterns are revealed, the rôle of oceanography corresponds to that of meteorology in predicting the conditions to be found, and the task of the fishery biologist is then to predict the response of the fish stocks to such conditions.

IV. Oceanography and the Abundance of Fish

In this part of the program three types of problem, with a common basis, may be considered :

1. the natural abundance of fish in an area, a problem which has a practical meaning only for unexploited areas, although a method of estimating the potential natural abundance of an exploited stock might solve many of the problems concerning abundance under conditions of exploitation ;
2. the fluctuations in abundance which have manifested themselves in all exploited stocks, whatever the degree of exploitation ; and
3. the special problem of the effect of fishing operations on the abundance of the stock.

1. *Natural Abundance*

The assessment of the natural abundance of stocks in virgin areas is a task of peculiar difficulty which demonstrates, perhaps more than anything else, the special character of the work of fisheries science and the abstruseness of its problems. A simple example will serve to indicate the nature of the problem and the difficulties. Somali fishermen have for many years been catching tuna off the Somali coast, and for some years a few small canneries have been processing this catch for the export market. The canneries would like to expand their operations, but to do so they must increase their catch of tuna. The question is : do substantial stocks of tuna, accessible to fishing craft operating from Somalia, inhabit the waters of the Arabian Sea east of Somalia, or are the occurrences from which the fishermen have made their catch merely sporadic invasions from a principal area lying remotely from Somalia ? This may be a question of ontogenetic distribution pattern, the understanding of which could lead to a method of predicting the times and conditions under which these occurrences take place, and even of the fluctuations in relative numbers of fish appearing from time to time. But this would still be insufficient : the cannery operators must have some indication of the actual numbers likely to be available in order to decide the amount of fishing equipment (craft and gear) which could be used effectively, and of the amount of processing equipment which would be required to handle the catch.

There are probably two broad avenues of approach to this problem. One is by way of evaluation of the area in terms of basic productivity and description of food chains. This would be possible only for stocks endemic to the area and not to transients. The other approach is by way of special sampling which, in the case of pelagic stocks, may include aerial observation. It may be noted that in this field of work there is urgent need to elaborate and improve the

methodology of searching and sampling and it seems likely that greater use can be made of reference to oceanographic factors as determinants of the behavior of the fish.

In the more general task of measuring the productivity of an area, and relating it to water and meteorological conditions, the oceanographer must play a leading rôle ; the more restricted task of the fishery biologist is to develop the understanding of the nutrition of the economic species so as to be able to use the data on food availability.

2. *Fluctuations in Abundance, and the Effect of Fishing Operations on Abundance*

The structure of the problem was symbolized by Russell in his well-known equation (7), which says that the difference in a stock of fish between one season and another can be represented by the balance between Growth + Reproduction/Natural Mortality + Fishing Mortality. These four elements can be taken as the plan for enquiry.

Growth. The growth of any individual may be taken to be the result of the operation of factors which may be considered in three groups, (*a*) genetic, (*b*) food supply, and (*c*) the environment affecting food procurement and the subsequent metabolism. Between these arise interactions. In the past, fisheries biology has concerned itself chiefly with measuring and describing the ontogenetic manifestations of growth : it has made little analysis of growth itself as a physiological process. The initial approach has, however, furnished a useful description of the grosser features of the problem, and some attempt has been made to measure the relations between the rate of growth and food availability and environmental conditions. Whether much further progress can be made along this line before more detailed enquiry is made into the physiology of growth might be questioned, but both types of enquiry require much information from oceanography on the environment of the fish.

The first information required is that concerning food availability ; the second is that concerning temperature, salinity, trace elements and biotic factors which influence the procurement of food by the fish and the processes by which it digests and assimilates what it ingests. But the work of fisheries biology has been concerned, generally, with estimates of average growth in populations and with these as a means of characterizing year-classes and the conditions prevailing from year to year. Recent work has carried the theory further to attempt to use such growth data as a means of estimating the biomass production of the population as a whole. Such work will accomplish a practical effectiveness, however, only after the underlying physiology of nutrition and growth have been studied further. This will mean, as in the study of nutrition and growth of domestic animals, that there must be controlled experiments in which both food supply and environmental factors are at least precisely measured if not actually controlled.

In this field of enquiry, taking it to be the responsibility of fisheries biology to measure the growth of the population, the contribution of oceanography is twofold — initially in aiding the description and analysis of these systems, and subsequently in providing data for a prediction system. In the initial phase the contribution is of data on all factors which might directly or indirectly affect the nutrition and growth of the fish. In the prediction phase the data would concern certain critical factors.

Reproduction. Although in the fishing theory equation this term refers essentially to *recruitment* into fishable stocks, the fisheries biologist has some concern with the whole range of phenomena which lead to the reproductive act, and those which lead from that act to recruitment. This means that there is a concern with sex ratios and fecundity, with length and age at first maturity and, within each season, of the maturation of the gonads, with the spawning act itself (including fertilization), with embryonic development and hatching, with larval and post larval development, and with growth and survival through these and the young fish stages. Some workers consider that the only practicable approach to the problem of replenishment of the stock is to measure recruitment as it is taking place, or the potential recruits shortly before they enter the fishery. Other workers contend that it is possible to enter more deeply into the system and to attempt some measurement of the series which connects spawners with recruits. Among these latter there are some who believe that although, in general, the eggs produced at each spawning are always numerically so far in excess of the individuals which survive to be recruits to the fishery that little connection can be found between the number of eggs spawned and the subsequent recruitment. Nevertheless, the brood strength is determined in the main by one or more critical factors at certain critical points in the life of the brood. Efforts at demonstrating this hypothesis have aroused some controversy. However, it is unquestionable that the sequence described above is closely dependent upon environmental conditions and that any understanding of it, let alone any measurement of it or formulation of a prediction system, must make demands on oceanography.

Natural Mortality. This term is perhaps even more recalcitrant than either 'Growth' or 'Reproduction.' It may be argued, *a priori*, that mortality may be caused by predation, parasitism, disease, lethal genetic characters, malnutrition or physical factors, such as temperature and salinity extremes, but there seems to be little prospect yet of measuring the result of the operation of each of these factors separately or, as an antecedent to that result, the intensity of each factor. Nevertheless, the fisheries biologist can look again to oceanography for some of the information he will require in this field. At the present stage, natural mortality must be accepted as a sum arrived at after deducting measured fishing mortality from estimated total mortality. It might be possible to correlate variations in natural

mortality with variations in environmental factors and thus to approach both analysis of the causes and prediction of intensity.

Fishing Mortality. In this field, oceanography has a small contribution to make in respect of the influence of weather and sea conditions on the intensity of fishing operations and their efficiency, but further consideration of this to is deferred to section 6 of this paper.

Fluctuations in Abundance. A great deal of work has been done in describing the fluctuations in abundance of exploited stocks and analyzing these fluctuations in terms chiefly of variations in strength of brood-classes and in recruitment into fishable stocks. This work can proceed at various levels — either with simple description of the fluctuations and elementary correlation with various environmental factors, a course which does not promise much reliability in its results ; or with varying degrees of penetration of the analysis into the systems, with the conviction that if relationships are truly identified and relations usefully measured, prediction systems may be evolved with a practical and reliable value.

3. *Fishing Theory.*

Perhaps the ultimate objective of fisheries science in respect of fishing operations is to prepare for each unit fishery a description of the fish stocks and of the effect on them of the fishing operations, in order to permit the design of a plan of management of the fishing operations which will ensure the best exploitation of the stocks. The description for each unit fishery will be along the lines of the Russell equation, and the dependence of this work upon oceanographic enquiry is clear.

Best exploitation clearly means that which will give the best and most sustained yields, and it may be signified by the term 'fish husbandry' — a concept which has recently emerged in respect of marine stocks and which deserves consideration though the end-result might not be precisely analogous to animal husbandry. This touches upon the possibility that there might be other direct intervention in the stocks besides the fishing operations. Some speculative thinking has turned to the possibility of intervening in some of the basic phenomena of the sea, and there have been experiments in fertilization. The realization of artificial upwellings or of control of the movements of marine stocks is perhaps not feasible as it would probably involve operations quite as ambitious as the fishing itself.

V. Oceanography and Behavior of Fish

Most of those who make their livelihood by fishing, especially perhaps those who do it in a small way, know a good deal about the movements, shoaling and feeding habits of the fish on which they depend. The knowledge, however, is not very accessible or systematic

nor, therefore, very susceptible to extension and improvement. It will obviously need a good deal of physical as well as biological study to account for the behavior of fish shoals, and their changes in density, position and depth with wind, tide and other factors. The experienced fisherman does not expect a complete explanation but any advance which would allow him to improve his gear and methods would be very welcome. Reports have been given of fish moving away from shoal water before the approach of storms and heavy swell, of voracious feeding just before a storm and even of fish showing awareness of impending earthquakes, but here, too, the information is meagre and unsatisfactory. Some experiments have been made on the reactions of fish to light and something is known of the sort of bottom they prefer, but in this, too, there is much scope for careful observation and record. Fish behavior might well be a rewarding study and too little attention seems to be paid to it ; the collection and sifting of what can be learnt from fishermen would in itself be useful. But it is clear that the tremendous scope of the observations and experiments necessary for a study of these phenomena calls for all the resources of oceanography as well as those of fisheries research.

VI. Oceanography and Fishing Operations

The dependence of fishing operations on the weather and sea conditions might seem to need little discussion, but as oceanography and fisheries science advance it will always be wise to consider whether more knowledge of the behavior of the fish, or of the craft and gear, in different weather conditions, can be used to reduce loss or damage, as well as the time spent on unproductive effort. Methods of predicting waves and swell, and of obtaining warning of their approach, have probably arrived at a stage where they might be used to prevent journeys to offshore banks at a time when the swell found there is too high for fishing ; they might also help to prevent damage to moored or beached craft. There is also much to be learnt about the actual operation of underwater gear and the reactions of the fish under different conditions, and fresh opportunities are offered by the new methods of underwater observation, photography, cine-photography and television.

VII. Relations between Oceanography and Fisheries Science

There is really no need to emphasize the importance of data on the environment to a study of any organism (or population of organisms) and, as oceanography is defined here, it is the science which will furnish the environmental data required by the fisheries biologist. It is reasonable to argue that fisheries science can no more do without oceanography than agricultural science can do without meteorology. But whereas oceanography (the basic study) has the entire marine hydrosphere as its field of enquiry, within limits

set only by the interest of the worker and the facilities he can secure, fisheries oceanography is to be defined strictly according to the area of interest and the very practical problems which confront the fisheries biologist.

It will be clear from the foregoing, that many types of oceanographic information are required to solve the different problems found in fisheries investigations. Different variables have to be observed, with patterns and intensity of observation suited to the fishery problem. In the determination of general limits of distribution of fauna, or a species, broad isotherms, isohalines and so forth are sufficient, but for more detailed description of distribution a more precise measurement, with much narrower intervals between the isolines, is required. The oceanographic program for fisheries must, therefore, be planned with as clear a view as possible of the factors which influence the biologist's problem and of the use which he hopes to make of the material and data collected. It would perhaps not be dogmatic to say that where resources for oceanographic research are limited these should be employed in problems which can easily be formulated, rather than in broader fields in which there is only a general hope that the data will prove to be of use at some unspecified time in the future.

BIBLIOGRAPHY

(1) Ekman, S. *Zoogeography of the Sea.* Sidgwick and Jackson Ltd., 1953 London. 417 pp., figs., bibl., index. Price : 42*s.*

(2) *Essays in Marine Biology, being the Richard Elmhirst Memorial* 1952 *Lectures.* Oliver and Boyd, London. 144 pp., figs., index. Price : 12s. 6*d.*

(3) Graham, M. *The Fish Gate.* Faber and Faber Ltd., London. 1943 199 pp., figs., illus., bibl., index. Price : 12*s.* 6*d.*

(4) Kesteven, G. L. Fisheries and Weather. *FAO Fisheries Bulletin,* 1953 *6* (4) : 109-118. FAO, Rome, Italy.

(5) ————. The Scope of Fishery Biology. General Fisheries Council 1954 for the Mediterranean, *Proceedings and Technical Papers* No. 2, FAO, Rome, Italy. pp. 262-266.

(6) *Internationale Revue der gesamten Hydrobiologie und Hydrographie,* Leipzig, Germany.

(7) Russell, E. J. *The Overfishing Problem.* Cambridge University 1942 Press, London. 130 pp., figs., tables., bibl., index.

(8) Sverdrup, H. U., Johnson, M. W., and Fleming, R. H. *The* 1942 *Oceans : their Physics, Chemistry, and General Biology.* Prentice-Hall, Inc., New York, x + 1,087 pp., maps, tables, diagrams.

(9) Tait, J. B. Hydrography in Relation to Fisheries. *The Buckland* 1952 *Lectures.* Ed. Arnold & Co., London. 106 pp., figs., tables. Price : 7*s* 6*d.*

(10) Welch, P. S. *Limnology.* McGraw Hill Book Co., Inc., London 1935 and New York. 471 pp., figs., tables, bibl., index.

SMALL BOAT AND GEAR INSURANCE FOR CANADIAN FISHERMEN*

Hardship, arising from loss of, or serious damage to, fishing vessels, has long been a serious problem to individual inshore fishermen. This has certainly been the case in Canada, and probably in all fishing countries with long, exposed coastlines subject to periodic storms and other hazards. The marine insurance companies are willing enough to provide insurance coverage but rates must of necessity be high, not so much because the incidence of loss is high, but rather because of the costly administration involved in providing service to isolated communities over widespread areas. The cost of appraisal alone of a small boat, involving extensive traveling expenses, would necessitate a very high premium rate. This factor would appear to have been much more significant than actuarial data on loss experience. This is borne out by the fact that in those instances where the fishing vessels are in numbers sufficient to permit the application of group or "fleet" policies, the rates are much lower.

When the Canadian Government decided that some form of self-protection was desirable for small boat fishermen, a detailed study of the problem was carried out. All possible data were secured on loss experience over a period of years, and fishermen and fishermen's groups were interviewed to determine the attitude of fishermen and the extent to which they would be willing and able to contribute in the way of annual premiums.

In Canada, the coastal fisheries are administered by the Federal Government. Therefore, to provide protection services to enforce fishing regulations and to render services for the inspection of fish and fish products, a large field force is maintained with officers located in, or close to, all fishing communities. These officers were, therefore, available to carry out some of the routine duties in connection with any proposed insurance plan and particularly to take care of emergency situations without necessitating costly traveling expenses. However, it had to be borne in mind that these officers had other duties which had a prior claim on their time also that they were not trained in the rather complex business of vessel appraisal and damage adjustment. A small group of officers — 21 for all Canada — were assigned specifically to the insurance work, and given special training to familiarize themselves with the regulations, the special problems of insurance, appraisal of vessels and the cost of repairing damage. Area administrators were also appointed in the four main fishing regions — Newfoundland, the three Maritime Provinces, Quebec and British Columbia. Small clerical and stenographic staffs were provided to handle the initial checking and recording of applications, appraisals, adjustment of claims, and other local problems. In Ottawa, a headquarter's staff was established. Wherever possible, the work was organized on a decentralized basis so that speedy service could be given by the field and area officers.

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The question of determining a premium rate and indemnity structure which would be financially sound and at the same time attractive and inexpensive to fishermen, proved a difficult problem in view of the inadequacy of loss data and the recognized inability of small boat fishermen to pay substantial premium rates. It was recognized that a compulsory scheme covering approximately 20,000 small powered fishing boats would have a sounder actuarial base than a voluntary scheme. However, it was felt that, in Canada, a compulsory scheme would not be generally acceptable. Another factor necessitating an attractive premium rate, was that the great majority of fishermen in this class had never carried insurance and would have to be encouraged to enter such a scheme. It was decided that the plan should cover all marine hazards and in the initial stages should not differentiate between coastal areas despite indications that loss experience varied considerably. The main emphasis was to be placed on cases of total loss, although it was appreciated that serious damage also caused hardship, and a partial loss clause was considered. It was recognized that there might be some moral hazard attached to insuring isolated fishermen with relatively low cost vessels, but at the same time it was felt that a fishermen's boat was his most important possession: the destruction of his boat not only creates a loss in itself but also means a loss of employment and earning power.

Because of the continuing depreciation and present-day high costs, it was recognized that the average insurable value of fishing vessels would be relatively low, and the indemnity payable in the case of loss would, in most instances, not meet replacement costs. Much consideration was given to the idea of tying in a loan program to supplement any indemnity payment. However, it was decided that the field of credit should be kept separate from insurance, and that a credit program could not be operated successfully by granting credit on the basis of payment of a small annual insurance premium without giving attention to all the other considerations involved in sound loan policy. The credit problem was, therefore, left for attention at a later date. It was felt that while the indemnity might be low it would serve as a down payment on a new boat, and that other sources of credit would be available to financially responsible fishermen.

It was considered important that in the first instance the greatest possible degree of flexibility should be maintained, and it was decided to establish a fund of working capital and to administer the plan under regulations approved by the Government; these could be readily amended to meet particular conditions as they arose. Experienced commercial marine insurance officials advised in establishing the initial regulations.

The Canadian plan, as introduced in July 1953, was confined to fishermen-owned, powered fishing vessels having an appraised value ranging from C$250 to C$7,500. A fisherman was defined as one who earns a substantial proportion of his income from fishing. Appraised value was based on the replacement cost of a vessel adjusted for its age and condition. The upper limit of C$7,500 represents the approximate

break between inshore and deep sea fishing craft, and it was felt that those with more highly valued vessels would have earnings sufficient to cover the cost of commercial marine insurance. Most such vessels have in the past been covered by commercial insurances. In appraising a fishing vessel, the total value includes the value of the hull, the means of propulsion, the fixed hull equipment, and special equipment and lifeboat, but it excludes all equipment which leaves the vessel during a fishing operation. The question of insuring fishing gear and equipment was considered to be separate from that of vessels ; the considerations pertaining to gear will be discussed later in this article.

Aside from ownership and the value limitations, a vessel to be eligible has to be appraised and declared seaworthy before a fisherman's application for insurance is accepted. While such things as fire extinguishers are encouraged, they are not essential for acceptance into the plan.

After full consideration, it was decided to initiate the plan with an annual premium rate in all areas of 1% of the appraised value of the vessel, and to provide an indemnity of 60% of the appraised value in the case of total loss from all causes other than willful damage, use for illegal purposes, hostilities or warlike operations, or labor disturbances. In the first instance, negligence was also included as an exemption from payment, but since it would, in practice, be impossible to establish whether or not the fisherman had been negligent and the extent, if any, of such ' negligence, ' this word was dropped from the regulations within the first month of operation. Total loss is interpreted to include disappearance or total destruction of the vessel or damage to the extent that the cost of repairs, including towage and salvage, exceeds the total appraised value.

In view of the low premium, it was not considered possible to provide any substantial indemnity in the case of partial damage, and particularly as only cases of very serious damage could be included. It was decided, therefore, that no damage claims would be eligible unless the cost of repairs exceeded 30% of the total appraised value of the vessel. Where the repair cost was above 30%, the indemnity was set at 85% of the additional cost. A fisherman may, of course, have more than one partial damage claim during a year, but each accident stands on its own, that is, the cost of repairing two or more minor accidents cannot be accumulated to comprise a valid partial loss claim.

Since the basis of the plan was to assist fishermen to get back into fishing, the actual repairs must, in most cases, be carried out before a claim is considered valid, although exceptions can be made if the fisherman has good reason for not wishing to repair his vessel. Insofar as total loss claims are concerned, the fisherman is under no obligation to replace his vessel. In all cases the wreck, if any, remains the property of the fisherman.

At the end of each policy year, a fisherman may renew his insurance up to 95% of the previous appraised value without a reappraisal. However, an effort is made to reappraise all vessels at least once every two

years, and generally this is done each year. It has been found that many fishermen add new equipment and effect other changes which make annual reappraisal desirable. Provision is included in the regulations for reappraisals and adjustments during the policy year, if requested by the fisherman or considered desirable by the Minister of Fisheries. If a vessel is found, on examination, at any time to be unseaworthy, such vessel may be declared ineligible for indemnity for total or partial loss occurring while on a voyage and until such time as declared seaworthy. The policy is voided in the event of payment of a total loss claim or sale of the vessel by the fisherman. There is no provision for a rebate of premium in the event of seasonal lay-up of the vessel because of the low total premium collected.

The above presents a general description of the operation of the plan, and indicates some of the questions which must be taken into consideration. Fundamental to any insurance plan, however, is the establishment of confidence on the part of the fisherman and a willingness on the part of the government or agency to put its faith in the integrity of the individual fisherman.

In Canada, it is estimated that some 20,000 fishermen own vessels of the class which would be eligible under the present plan. It was not anticipated that all fishermen would immediately seek insurance coverage and, apart from general press and radio announcements, no special campaign was undertaken to induce fishermen to enter the scheme. Field officers of the Department of Fisheries were all given handbooks and other literature on the plan, and were thus in a position to inform and advise fishermen.

Critics of the plan believed that it would attract largely the owners of older, heavily depreciated vessels, and those fishermen operating in the most exposed and dangerous areas. These fears have, however, not been borne out by experience. While definite figures are not available on the loss experience of those who have not taken up the plan, there is every indication that those under the plan have not suffered excessive loss experience in relation to the over-all experience of all fishermen.

As indicated above, the initiation of the plan was given general press and radio publicity, and handbooks outlining its main features were made available to all interested fishermen. The special field officers employed under the plan were assigned to particular areas of the coast, and travel from community to community to discuss the plan with individual fishermen and fishermen's groups. Bearing in mind the general lack of familiarity with any form of insurance, the response of fishermen was surprisingly good. The plan as offered appeared to meet with no serious objection, either from the point of view of the premium rate, or the indemnities offered. In some areas coverage in excess of 60% was desired and arrangements were made for fishermen to insure the other 40% of total appraised value under a commercial policy.

During the first 12 months of operation a total of 2,236 fishermen had their boats covered under the plan. In the same period 18 total

loss and 7 partial loss claims were paid. The following tables indicate the experience by areas.

TABLE 1 — TOTAL CERTIFICATES OF ELIGIBILITY ISSUED TO FISHERMEN, 6 JULY 1953 TO 9 JULY 1954

Province	Number of Vessels	Total Value C$	Average Value C$
Newfoundland	1 155	954 572	826
Nova Scotia	382	713 989	1 869
New Brunswick	73	136 504	1 870
Prince Edward Island	75	75 215	1 003
Quebec	219	189 934	867
British Columbia	332	1 256 103	3 783
Total	2 236	3 326 617	1 488

TABLE 2 — CLAIMS PAID ON VESSELS, 6 JULY 1953 TO 9 JULY 1954

Province	Total Losses		Partial Losses		Total	
	No.	Value C$	No.	Value C$	No.	Value C$
Newfoundland	7	10 440	2	405	9	10 845
Nova Scotia	5	5 430	—	—	5	5 430
New Brunswick	1	2 400	—	—	1	2 400
Prince Edward Island	—	—	—	—	—	—
Quebec	4	2 694	5	365	9	3 059
British Columbia	1	1 449	—	—	1	1 449
Total	18	22 413	7	770	25	23 183

Between 9 July and 31 December 1954, 667 new certificates covering vessels not previously under the fund and 841 renewal certificates were issued. The number of certificates in effect at 31 December 1954 totalled 2,272.

On 11 September 1954, the Atlantic Coast area, particularly southwestern Nova Scotia and Quebec, was hit hard by Hurricane "Edna." While very few vessels were caught at sea, those moored in exposed harbors and along the beaches were severely battered by wind and tidal waves. Forty-two claims were approved and total loss payments were made in 35 cases. A further 7 claims were settled on a partial loss basis. These losses, together with other occasional losses, brought total claims over the 18-month period to 67, and partial claims to 24. Of the 91 cases of loss or damage during the first 18 months

of operation under the plan, fire was responsible for 15 cases, storms for 66 and miscellaneous causes for the other ten. In only one instance was a third party involved. For the 18-month period, net premium revenues amounted to C$53,225 and claims paid amount to C$63,282. The over-all objective of the plan has been to keep premium revenues and loss expenditures in balance, while administrative costs are taken care of by the Government out of general tax revenues.

The plan to date has worked quite satisfactorily for both the government and the fisherman. A number of minor amendments to the regulations have been necessary mainly to make the meaning more precise and to establish definitely when rebates of premium should be paid, and the definite effective dates of changes in valuations. The field appraisers have had no difficulty in arriving at values satisfactory to fishermen and there has been no marked need to refuse applications on the grounds of unseaworthiness or other causes. The general class of vessels covered by applications, while frequently low in value, has been acceptable from an insurance risk point of view.

The effect of Hurricane "Edna" was abnormal, but this was the type of situation for which the plan was designed to provide assistance. Many uninsured vessels were damaged or lost as a result of it, but the fishermen involved had accepted the risk on their own account.

In December 1954, representations were made on behalf of the British Columbia fishermen, where only one total loss and no partial loss had been experienced by the 372 vessels under the plan in that province. The average value of vessels in that area is the highest in Canada and most of the operations of small boat fishermen are carried on in protected inshore waters. As a result of this favorable experience, the Government authorized an increase in the total loss indemnity from 60% to 70% and extended the partial loss indemnity to cover 85% of the cost of repairs in excess of 15% of the appraised value of the vessel. It is anticipated that the indemnity rates in other areas will be adjusted when necessary.

Lobster Traps

About 11,000 Canadian fishermen engage in the lobster fishery of the Atlantic coast region. These men operate close to two million lobster traps at an original cost of about C$8 million. The annual disappearance of traps through storm loss and annual wear and tear appears to be in the neighborhood of 500,000, valued at C$2 million, and represents some 14% of the annual value of the catch. While wear and tear must be considered as a normal operating cost of all fishermen, losses through storms in any one year are usually concentrated in a few areas and cause considerable hardship in such areas. This is particularly true if the losses occur early in the fishing season as the fisherman not only loses his capital, but also all or part of his earning power.

From time to time in the past, it has been necessary for both the provincial and federal governments to come to the assistance of fishermen, who have suffered severe losses of lobster traps, either through grants or loans. The experience of governments in making such loans has not been satisfactory, and some form of insurance seemed desirable.

Although considerable data were available in certain areas for particular years, when special surveys were made, no really useful actuarial data were available on which to base a rate and indemnity structure. Again, the problem was to devise a scheme which would be attractive to fishermen while permitting a reasonable degree of assurance that premium revenue would, over a period of years, meet the outlay in the form of indemnities. Although it was recognized that there was little likelihood of all fishermen coming under a plan, it was necessary to assume that those who did would not be too highly biased towards consistently high losers.

It was clear that there would be a wide variation in loss experience in particular years. Every lobster fishing area runs the risk of danger from storm damage, but the experience of some areas has been much worse than others. Methods of fishing also appear to have considerable bearing on individual loss experience. Shallow water fishermen run greater risks than those who operate in deeper waters, and some fish the most dangerous areas regardless of losses because of the larger potential yields. Another variable is the length of the legal fishing period which ranges from 33 days in the area with the shortest season, to 203 days. And the traps used, which are all of wooden construction, differ considerably in size, and cost from C$3 to C$7 per trap.

It was decided to make the plan as simple as possible and to ignore all differences except length of season as it was found that more facts were necessary before any detailed refinements could be made. The most difficult problem was to determine the point above which losses should be considered abnormal, or due to storm damage, since there would be no way of ascertaining whether traps disappeared because of battering by storms or because they were worn out. In the first instance, it was decided to use 25% of the total to represent normal "wear and tear," as most fishermen agreed that traps usually last from four to five years. The initial program called for a premium of 7½ cents per trap in areas with a legal fishing season of less than 90 days and 15 cents per trap where the legal fishing season was 90 days or over, and it provided an indemnity of C$1.50 per trap on disappearance of traps in excess of 25% of the total owned by the fisherman. The traps were to be counted at the beginning and end of the season.

Very few fishermen accepted the plan in the first areas when the season opened. The first real test came in the winter season in southwestern Nova Scotia where 227 fishermen came under the plan with 55,698 traps. Before this long season opened, the premium rates and indemnities had been adjusted according to the average value of the traps owned by each fisherman.

The schedule was:

Average Value of Traps C$	Premium Rate *cents*	Indemnity Payment on Losses over 25 % C$
2.00 - 3.00	$8^1/_2$	1.25
3.01 - 5.00	13	2.00
5.01 - 7.00	20	3.00
7.01 and over	25	4.00

The 227 fishermen who came under the plan represented about 9% of the possible total. Many others were interested, but preferred to wait and see how things would work out in the first year. The long winter season proved to be more severe than usual through high winds, and losses were generally high. All but seven of the fishermen under the scheme sustained losses in excess of 25%, and the over-all average was 51.4%. Complete data were not available on those fishermen who did not join, but there was sufficient evidence to show clearly that those within the plan were generally those in the most vulnerable areas, taking the greatest risks. For the area, indemnities paid exceeded premium revenue by about four to one with a net loss to the Government of approximately C$35,000.

For the areas with seasons below 90 days a premium rate and indemnity structure similar to that used in the long season, was tried in the summer of 1954 with the rates set at about 60% of those in the long season areas and the allowance for annual wear and tear was reduced to 20%. Again the response by fishermen was slight. The loss experience was not as high as in the long season areas, but indemnities paid exceeded premium revenue by about three to one.

When the long season reopened on 1 December 1954, it was felt that some adjustment was necessary in view of the high loss ratio of the previous year, but it was difficult to find a formula which would protect the government against undue loss and at the same time make the plan worthwhile to fishermen. The premium rates were raised modestly and the indemnity payments were slightly reduced. However, despite the high returns received by insured fishermen in the previous winter season, the take-up by fishermen was even more disappointing.

Efforts are still being made to devise a more acceptable plan, but unless it can be made to appeal to a higher percentage of the fishermen on a voluntary basis, it may be necessary to discontinue it. The administrative costs are too high to justify serving only a small percentage of the fishermen. Some thought has been given to basing eligibility for payments on area losses rather than on individual losses, but this would, of necessity, be a compulsory scheme and more basic data would be necessary on regional experience before such a plan could be effected. Present evidence appears to indicate that even within very small areas there is a wide variation in loss experience.

The lobster trap plan has proved to be much more difficult to administer than the vessel scheme, particularly because losses occur,

a few at a time, over an extended period. Since these losses are frequently replaced during the season, it is necessary to ensure that the records are at all times complete and that premiums are paid on the traps replacing those lost. The dependence on the integrity of the lobster fishermen for verification of losses has not appeared to be a serious factor.

Considerable pressure has been brought to bear to extend the insurance plan to other types of fishing equipment, such as nets, weirs, etc. But from the experience gained with the lobster trap plan, it is obvious that any attempt to insure fishing gear generally would be very difficult indeed. Most types of fishing gear, especially nets, wear out in two or three years and the constant repair of such gear would make it almost impossible to identify the item insured. In areas where fishermen are well organized on a co-operative basis, it may be possible to make local pooling arrangements to take care of those who suffer exceptional losses.

Conferences and Meetings

10th General Assembly of the International Union of Geodesy and Geophysics, Rome, 14-25 September 1954

Meeting of the Association of Physical Oceanography [1]

The most striking feature of the meetings of the Association of Physical Oceanography was the evidence of the very rapid growth and almost revolutionary change in the subject since the Association first met in Rome in 1922. Then, and until quite recently, most oceanographic papers were illustrated with relatively simple charts and diagrams, such as the distribution of temperature, salinity and substances; now, most of them use graphs, more difficult to understand, which show the dependence of complex variables, such as water movement or changes in sea level, on one or other of the factors that have been found to influence them. Instead of general reasoning leading to oversimplified conclusions, the precise techniques of mathematics and physics show that the basic problems are more complex than had been supposed, and lead to some tentative solutions and cautious approximations. Descriptive accounts and qualitative statements still play a large role which must not be belittled, but much of the progress in oceanography is being made by detailed measurements and numerical study of the underlying physical processes.

[1] This, and the following article, have been written by G.E.R. Deacon, Director, National Institute of Oceanography, Wormley, Surrey, England.

Evidence of increasing momentum in the advance from exploration and survey to analysis and synthesis could be seen in all stages of the meetings, in the national reports, symposia and papers. The main symposium concerned storm surges, but the participants dealt with many effects of wind stress, friction, changes of barometric pressure and other factors, both at the surface and bottom of the sea, most of which were as important for the precise study of any kind of water movement as for storm surges. There could be little or no justification for any objection that too much time was being devoted to one rather special application of oceanography since the topics actually discussed covered most of the recent advances in marine physics.

It is only fair to admit that many of the experienced oceanographers, who have borne the burden as well as experienced the satisfaction of exploring and surveying the oceans, have now to listen to theoretical extensions of their work to which they can make little or no contribution; but at the meetings they gave no indication, as they would undoubtedly have done 20 years ago, that they felt that the new approaches were not sufficiently realistic to promise much help with the practical problems. It is difficult to urge the importance of new measures without appearing to undervalue what has been done already, but there is growing realization that although we possess a fairly satisfactory knowledge of the oceanic water masses we know too little about their movements to answer many of the questions that have proved to be important. Anyone trying to further our understanding of changes in distribution and abundance of marine animals and plants with the help of information about variations in surface currents and deep water movements soon finds out that knowledge of these water movements is quite inadequate for such a purpose. The disappearance of fish from their usual grounds, or the rapid growth of a fishery in a region previously not worth visiting, are often attributed to the effects of changes in the currents or water circulation, but we are never certain whether the current has changed, and the likelihood of being able to foretell such changes and their probable effects seems very remote.

The first reaction of the oceanographers is to urge that more observations should be made to ensure an adequate network of data. It can be argued that the more up-to-date science of meteorology passed through this stage some time ago; all the weaknesses in forecasting were put forward as tangible reasons for more observations, and there is no doubt that where the data are plentiful the day-to-day forecasts are remarkably good. But meteorologists are not satisfied, and to make further improvements they are pursuing active researches into the basic physics of the general circulation of the atmosphere. That oceanographers need more observations is certain, but there is no doubt that they will never get as many as they would like; to make the best use of their facilities they must, sooner or later, carry out a determined study of the basic physics of the water movements. This need is emphasized in the regions where there are already a large number of temperature and salinity observations. Tabulating, charting and

simple treatment of temperature and salinity data has led to disappointingly little understanding of the water movements. More data of the same kind will allow some improvement of the statistical picture of average and extreme conditions in extent and detail, but it will give very little information about the speeds of water movements and understanding of the cause and effect of significant changes in them.

The marine and fishery laboratories have always emphasized their interest in water movements, but have not had the means to study them. Many times in the past hundred years it has been shown that the movements of water on the rotating earth do not obey simple rules, and little real progress can be made till there are more physical oceanographers who have specialized in fluid dynamics. In the past, physical oceanography has been left largely to chemists, biologists, geologists and geographers and, now that their descriptive accounts have to be supplemented by figures and quantitative estimates, the mathematics and physics in oceanography must become as enterprising as that applied by meteorologists to the study of air movements. Even in relatively unknown regions, where the most important task is still to obtain a basic picture of the water conditions, some advantage will be gained by devoting part of the effort to making or supporting attempts to gain a precise understanding of the physical processes which bring about the observed distributions.

The oceanographers in Rome had, therefore, good reasons for welcoming the marked increase in papers dealing with marine physics. The fisheries scientists may not have been particularly interested in storm surges, but if they know how changes in barometric pressure, wind and climate, influence sea level and water movements, they will be able to supplement their necessarily infrequent and wide-spaced oceanographic observations with sufficient information from the meteorological charts to form a reasonably accurate assessment of any significant changes and to foresee some of the consequences.

Those of the delegates whose main interests are in the study of tides and surges had good reason to be satisfied with the program. Professor J. Proudman, retiring President of the Association, dealt with the unknown tides of the oceans. His address emphasized that as yet no measurements had been made of the tides except along the coasts and in shallow water, and he showed how our knowledge of the tides in the open oceans depended on the theoretical treatment of such observations. After summarizing what had been done, and outlining recent advances in his own laboratory (University of Liverpool, England), he showed that although results presented for certain narrow seas such as the Irish Sea, North Sea and English Channel, have been reasonably well verified, those for the deep oceans still lack confirmation.

Most of the work on storm surges has been done in the North Sea, and some of the papers emphasized the need for studying long waves and water movements associated with storms over the open ocean. Dr. Hachey showed how the density layering and plankton distribution off the coast of Nova Scotia could be changed very radically by storms passing at a great distance. The uncertainty of present estimates of

the drag of the wind on the sea surface at different wind speeds was emphasized, and it was clear that different approaches to the problem, such as measurement of the slope of water surfaces and observations of vertical profiles of wind velocity, gave different figures, probably because the basic mechanisms were not fully understood. There was also considerable discussion of the most satisfactory assumption to be made on the effect of friction at the sea bottom. The probable effects of standing and progressive waves, and of inter-action between them and the tides were considered. They have a direct bearing on many oceanographic measurements, and are of particular interest in the problem of storm surges since there is a remarkable tendency for the surges to have a greater effect on the sea level at low water than at high water. Professor Munk outlined a new method which allowed for better removal of the diurnal and semi-diurnal tidal periods from a record of sea level. Professor Bowden showed how sea level and water movements in the southern North Sea were affected by conditions in the English Channel and flow of water through the Strait of Dover. The use of models was discussed and the balance of feeling seemed to be that more should be done with simple models designed to investigate the effect of one factor at a time. The symposium acknowledged the usefulness of the existing formulae for predicting storm surges, but led to the general conclusion that a deeper insight into the underlying physical processes was necessary to make them more accurate and more generally applicable.

There was a lively symposium on Current Meters, and Dr. Böhnecke produced a useful scheme for classifying those that are already available in terms of the tasks they will perform. The symposium showed that no meter would satisfy all requirements. Marine physicists, who wanted continuous records of instantaneous measurements of velocity and direction, did not mind how elaborate their apparatus became so long as they themselves could make reliable measurements ; but fisheries scientists, who were not interested in the turbulent structure of the current, wanted single measurements, with the simplest possible equipment. Most of the meters were of the averaging type, registering the flow of water over pre-selected intervals. A small committee was formed to classify and summarize all the known methods.

The papers on sea waves showed that the need to consider the growth and decay of the complex pattern of waves in a storm or the growth and decay of a whole spectrum of wavelengths is now fully established. Considerable interest was shown in the problem of finding the direction of waves, and in the spread of waves from a storm and how they are propagated not only in the mean direction of the wind, but also at considerable angles on both sides of it. Evidence was given that short waves might be propagated in directions making angles up to 60° with the mean direction of the wind.

Papers were read on most of the other aspects of physical oceanography, including factors affecting productivity and animal distribution, currents, water circulation, topography and sediments of the sea floor, and other topics.

There was a discussion on the future of the Joint Commission on Oceanography. Everyone agreed that the Commission had done good work during the past three years, but there was little support for its proposal to establish a permanent bureau or International Deep Sea Council. Apart from reluctance to set up any new kind of authority there was a strong feeling that the existing scientific associations within the Union of Geodesy and Geophysics offered plenty of scope for discussing all the applications of science to the sea, except marine biology, and that there were advantages in discussing all aspects of oceanography in the same forum as the other earth sciences. It was unfortunate that the program of the Association of Physical Oceanography was too full to allow much opportunity for visits to meetings of the other associations taking part in the General Assembly where, among much of general interest to oceanographers, there were direct contributions to knowledge of what goes on at the surface and bottom of the oceans.

A small committee was appointed to consider proposals for collaboration in world-wide oceanographic researches during the International Geophysical Year. Its recommendations were aimed primarily at improving the understanding of the general water circulation of the ocean and the response of the sea surface to barometric pressure, wind and climate.

International Geophysical Year 1957/58

The idea of an International Geophysical Year (IGY) 1957/58 springs from the success of the two International Polar Years of 1882/83 and 1932/33, which made large contributions to the knowledge of geophysical phenomena, such as auroral displays and magnetic disturbances, by arranging simultaneous observations all round the magnetic poles. Interest in these studies has been greatly stimulated by the growth of radio-communications, radio astronomy, high-altitude flying and the discovery of a vigorous wind circulation at the highest levels of the atmosphere. Our knowledge of many of these phenomena, which affect the earth and atmosphere, is growing rapidly and there is increasing need for another joint observational program covering the whole world — the Antarctic as well as the Arctic, the magnetic equator as well as the magnetic poles, and the tropics as well as the polar regions. [2]

Although the initiative for the IGY came from those who are primarily interested in the ever-changing phenomena of meteorology, geo-magnetism, geo-electricity, ionospheric physics, etc., it is now evident that the program would be incomplete without simultaneous measurements and studies of the oceans. Interaction between the sea and the atmosphere plays a major part in atmospheric circulation, so that the physics of the air cannot be separated from that of the water, and their general circulations have much in common. There

[2] During the year 1957/58 sunspots are expected to be large; this is an important advantage since many of the phenomena to be studied are influenced by sunspot activity, which in 1932/33 was slight.

is also evidence that there are sea level disturbances coupled with barometric and magnetic phenomena in the atmosphere, and the background of the electric current fields now used to study water movements in the sea depends on events in the upper atmosphere. But for the efforts of scientists in the U.S.A., oceanographers might have avoided taking action on the grounds that their problems had not yet reached the stage at which there was an urgent need for a wide network of simultaneous observations and, except for the existing co-operation between fisheries laboratories, might have been content to follow their own lines of approach. This would, however, have been a frank admission of the backwardness of marine physics, whereas the active co-operation now being planned will be a great step forward.

The International Association of Physical Oceanography has now appointed a small committee to make recommendations; and the International Year Committee has accepted, with but little modification, the proposals agreed at the meeting of the Association in Rome, and has appointed its own committee to arrange for their implementation. The main plans are to obtain an understanding of sea level changes of both long and short periods and their relationship to other phenomena in the ocean and atmosphere, and to learn more about the water movements in the deep sea, both at great depths and near the surface, particularly in the equatorial region and in the approaches to the Arctic. This program requires:

1. Setting up apparatus at a large number of stations on oceanic islands as well as on the shores of the surrounding continents, to record:
   (*a*) tides;
   (*b*) long waves;
   (*c*) microbarometric oscillations, and
   (*d*) magnetic disturbances in addition to the usual meteorological variables.
   Because of the relationship between seasonal changes in sea level and the temperature of the water, regular bathythermograph lowerings to 900 ft. will be needed off as many of the stations as possible.

2. (*a*) A study of the distribution of temperature and salinity, and water circulation, along two extended north and south lines on the Atlantic coast, a reasonable proportion of the effort being devoted to the measurement of water velocities;
   (*b*) a multiple ship program in a suitable area on or near one of the north and south lines to obtain a synoptic picture of the paths of the surface and deep currents;
   (*c*) simultaneous investigations by a number of oceanographic ships of the distribution of temperature, salinity and other oceanographic variables, across the boundary region between temperate and arctic waters, with as many current measurements as possible;

(*d*) shorter lines of observations with current measurements across the equatorial region in the Pacific Ocean and a multiple ship program in one area if possible;

(*e*) auxiliary lines of observations in regions adjacent to the main profiles, particularly in and out of the Mediterranean Sea.

The principal studies are closely related to each other and both are of outstanding importance to the systematic development of oceanography and to the success of its applications to many practical problems, including the fisheries. They touch on many other fields of activity of the International Geophysical Year, particularly meteorology, and they are in the true spirit of international co-operation, requiring simultaneous measurements at widely separated points on the earth's surface and facilities such as can be obtained only by the pooling of the resources of many nations. There are likely to be some subsidiary measurements, such as studies of the CO_2 balance between sea and air, dust counts, magnetic observations, and studies of waves, sediments, and the structure of the earth's crust.

The International Year Committee hopes to secure the support of the International Council for the Exploration of the Sea, the International Commission for the Northwest Atlantic Fisheries, the Pacific Science Council, the Pan-Indian Ocean Scientific Congress, the Scientific Congress, the Scientific Council for Africa South of the Sahara, and the national committees which deal with oceanographic research. Details of what will be needed to make a success of the program are now being worked out so that these authorities can be approached.

FAO Consultants' Meeting on Documentation and Related Services for Fisheries Biology

In embarking upon a comprehensive survey of the information available on the living aquatic resources of the world, the FAO Fisheries Division has been faced with the problem of listing, indexing and abstracting the steadily increasing flow of relevant biological publications. The task is complicated by the often variable, and sometimes inconsistent, usage of a number of technical terms in the literature. In order to seek advice in overcoming these difficulties, a meeting was convened in Paris from 8 to 14 December 1954.

The meeting was held at the office of the Institut scientifique et technique des pêches maritimes and was attended by the following:

FRANCE	Mlle. Boussion	Librarian, Centre national de la recherche scientifique
	R. Charpy	Conservateur, Service Central des Eaux et Forêts
	J. Furnestin	Directeur de l'Institut scientifique et technique des pêches maritimes

W. Germany	Dr. M. Scheele	Limnological Station, Freudenthal
Iceland	Dr. A. Fridriksson	General Secretary, International Council for the Exploration of the Sea
Italy	Prof. G. Bini	Editor, *Bibliographia Oceanographica*
Netherlands	Prof. P. Groen	First Scientific Collaborator, Koninklijk Nederlands Meteorologiese Instituut
Sweden	Dr. S. Runnstrom	Director, Institute of Fresh Water Research
United Kingdom	Commander J.R. Lumby	Editor, *Journal du Conseil International pour l'Exploration de la Mer*
	Prof. H. Scott Gordon	King's College, Cambridge
United States	Dr. G. Myers	Fish and Wildlife Service

Professor G. Bini was elected chairman. Dr. J.E. Holmstrom represented UNESCO, and Dr. G.L. Kesteven, Dr. E. Hess and Mr. S. J. Holt attended on behalf of FAO.

The following brief account of the proceedings, under each item of the agenda, is based upon conclusions and recommendations adopted at the final session which were embodied in a report submitted by the consultants to the Director of the Fisheries Division for his consideration.

Terminology and Definitions

The meeting was asked to consider the scope of fisheries biology and its relations (*a*) with oceanography, limnology and other sciences concerned with the fisheries resources and their environment, and (*b*) with fisheries economics and fisheries technology, which are concerned with the human element in the environment of these resources. Three working papers were considered — The Scope of Fishery Biology (*Proceedings and Technical Paper* No. 2 of the General Fisheries Council for the Mediterranean : FAO, Rome, 1954) ; an alphabetical list in English of a number of fisheries terms suggested as needing definition or explanation ; and sample paragraphs on fisheries science and the contents of fisheries biology prepared on the model of the UN Multilingual Demographic Dictionary (*Population Study* No. 19, 1954). In this last document, the concepts to which the terms related were explained, not by formal definitions, but by showing each term in a typical, illustrative context. These contexts form paragraphs of chapters relating first to general concepts of utilization of natural resources and then to specific methods used and phenomena encountered

in biological studies of fisheries resources. During the meeting improvements were made to these statements and it was recommended that the Fisheries Division should continue the work it had begun with the aim, eventually, of producing a publication in one, or several, languages which would combine both methods of definition. The Group agreed that it would be useful if a panel of consultants could continue to be made available to FAO, to whom reference could be made for the definition of the meanings of terms, for the review of further drafts of the 'dictionary' and for similar purposes. Likewise, the Group recommended that panels should be established for economics and technology.

Classification and Codification

The general principles involved in the examination of published records were discussed. It was recognized that these involved operations in three distinct stages, which became progressively more separated according to the magnitude of the program. They are the bibliographic stage, consisting of labeling each item of the record, classifying the reference according to subject and listing the references; an analytic stage, consisting of the preparation of advanced informative abstracts, either as written synopses or in a codified form; and a synthetic stage, consisting of arranging the data thus extracted in a meaningful way.

The Group had before it for comparison four classification systems relating, specifically, to fisheries matters, and extracts from other systems, including the UDC, appertaining to these. Detailed consideration was given to a draft three-figure special decimal classification for fisheries, which had been prepared by FAO on the analogy of the Oxford System for forestry, and arranged like the latter to dovetail into the UDC, while at the same time embracing, in its own divisions, all the necessary material relating to fisheries science, including the economic, social and legal aspects. The Group recommended that work on the development of this classification should be continued and, in particular, that it should be developed in a way which would not prejudice the possible use of systems for automatic selection by punched card machines. It was also recommended that the International Union of Geodesy and Geophysics, the International Union of Biological Sciences and the International Federation for Documentation should be asked to assist generally, also in developing certain chapters relating to their respective interests. The Group discussed the problems of codification of data which might be undertaken for the purposes of the FAO Aquatic Resources Survey. It was unable to carry its discussions to any definitive point and recommended that the Biology Branch should prepare a list of resource characteristics of which notice should be taken during the survey, and schedules of the form or the value which these characteristics might take, and should submit these to the consultants.

Finally, the existing bibliographic services for fisheries science, and in particular for fisheries biology, were discussed. While it was recognized that a complete bibliographic service could be achieved only at great expense, it was felt that the present services for fisheries science were inadequate in the sense in which the science had been defined at the meeting. There existed no single service which covered every aspect, even for a limited region, and although much of the literature is listed and abstracted by various services, these lists are dispersed through numerous periodicals. The Group, therefore, recommended that steps should be taken to improve this situation. It considered that the *Bibliographia Oceanographica* could well be developed to constitute the basic world list for marine fisheries ; it made specific recommendations regarding this development and suggested ways of providing a corresponding service to cover inland fisheries.

The Group was unable to estimate the importance of providing a consolidated abstracting service for fisheries biology, considering that establishment and maintenance of such a service is extremely expensive and that existing services might be able to fill the need for the time being. The Group agreed and recommended various measures to help make these services more useful to fisheries biologists.

The question of annual reviews and comprehensive reviews covering well defined parts of the subject was discussed and the policy of publishing review articles in the *FAO Fisheries Bulletin* was suggested, with a recommendation that work should be continued on these lines.

It was agreed that continued co-operation on the above matters was desirable, and for this purpose the meeting was divided into four informal panels to be available for consultation on the questions of bibliographic listing of marine fisheries, bibliographic listing of inland fisheries, abstracting, and documentation methods respectively. All the members of the Group offered to act as contacts for correspondence on terminology and definitions, and it was agreed that further meetings should be held.

Gulf and Caribbean Fisheries Institute

The seventh session, held in Havana, Cuba, from 15 to 19 November 1954, was attended by more than 150 delegates from a number of countries. Dr. B. F. Osorio-Tafall, FAO Regional Fisheries Officer, represented FAO, and participated as a member of the Discussion Panel of the Biological Session. In the Caribbean Session he used, as a basis for his report on the FAO project for surveying the living aquatic resources of the world, a paper prepared by Dr. G. L. Kesteven, Fisheries Division, entitled "FAO Plans for a Survey of Living Aquatic Resources."

Other sessions in which papers were presented included Industry, Technology and Exploratory Fishing, and Economics.

Fisheries Division Activities

Program of Work - Biology Branch

The work of the Biology Branch of the Fisheries Division is based upon the premises, firstly, that fishery industries and administrations have need of a precise description of fisheries resources and, secondly, that the development of this description will be most speedily and effectively accomplished if there can be some measure of international collaboration between those who are concerned with carrying out investigations in fisheries biology.

The truism that all fisheries industries are dependent upon the resources being exploited, does not mean that the resource is the only factor determining the size and condition at any particular point in time of any particular industry. Very often, in the presence of abundant resources, fisheries industries remain relatively underdeveloped because of limiting factors, such as the nature and amount of equipment available for fishing, and the arrangements and facilities for marketing and for processing. The basic element of the industry is undoubtedly the resource, of which the fisherman requires to have the fullest possible information. He needs to know not only where the fish can be found and the quantities in which they occur, but also how they will behave under various conditions so that he can adjust his fishing gear and its use to anticipate that behavior. He must know how his fishing operations affect the stocks he is exploiting, and at times he needs to be advised as to how he should modify his fishing operations to ensure that, if possible, these operations should have beneficial effects on these populations or at least should not have adverse effects. In order to be able to assist the industry to develop and improve its operations (either for expansion or for conservational restraint) administration also has a need for this information. The fishermen, of their own initiative, obtain much of the information they need ; but a great deal more has to be learned by means of serious research work, which often requires considerable expenditure on personnel, research vessels, laboratories and equipment. In general, the conduct of such research is the responsibility of the government, and only exceptionally is this work done by non-governmental institutions. Most countries of the world have some program of research work directed upon their fishery resources, but there are still many countries which do not have the personnel and the facilities for such research.

The conduct of these research programs has several international aspects, one of which is the basic internationalism of science. It is traditional that scientists should communicate with one another regardless of national boundaries, and much of the progress of science has been made possible by the international exchanges that have characterized the history of science. Modern methods of communication have

done much to facilitate such exchanges. Scientific journals and periodicals are freely exchanged between countries, and scientists exchange papers one with the other. These exchanges are supplemented by correspondence and personal meetings between individuals, and at congresses. Much of this exchange of information in respect of fundamental science is provided for by international learned societies and congresses, but in respect of the applied science of fisheries biology there did not exist, until recently, systematic machinery for these exchanges. One particular region of the world which was especially fortunate in this matter was the North Sea and the North Atlantic for which a Permanent International Council was established at the beginning of the century. Various other bodies have been formed with similar purposes, and more recently, since World War II, sufficient of these bodies have been established to provide for collaboration in respect of the greater part of the globe. The role of the FAO Fisheries Division in this matter has been to lend its aid to the creation and maintenance of these bodies. It has established under its aegis the Indo-Pacific Fisheries Council and the General Fisheries Council for the Mediterranean. A Council for Latin America has also been proposed. It must be stressed that these bodies are concerned with the entire field of fisheries and not only with fisheries biology. Their work, as a consequence of the emphasis placed on the applied nature of the research and recognition of its responsibility toward fisheries industries administrations of the various regions, has been oriented essentially to the real problems of the industry.

In order to fulfil its responsibility of assisting these international councils and commissions in their work concerning the fisheries resources of the world, the Biology Branch carries four basic activities. Firstly, it maintains contact with fisheries biologists all over the world either directly or through their institutions, or through international organizations. Through these contacts it endeavors to have always an up-to-date knowledge of the status of fisheries biology and of recent results obtained, also to facilitate contact between different workers. Suggestions are made to workers as to contacts they might develop and to ways in which they might improve their programs.

The Branch contributes to the bibliographic program for fisheries biology. It has compiled bibliographies on subjects such as algae, pond culture, and Tilapia, and is constantly preparing special bibliographies on enquiries received from workers in many different parts of the world. It prepares bibliographic notes and lists for publication in the *FAO Fisheries Bulletin*, and it is collaborating, with the editors, in the compilation of the *Bibliographia Oceanographica*. One of the responsibilities of an international organization is to carry out work to promote improvement and standardization of terminology and methods, and the Branch has found that this is especially important in the field of documentation for fisheries biologists generally and for the Branch's own program. Accordingly, the Branch is engaged on a project to review the documentation program for fisheries biology. A group of consultants was called together in Paris in December 1954 (*see* pp. 25-28) to con-

sider the terminology for fisheries biology, the classifications and codes which are required in this field, the documentation techniques which should be used in searching for titles, interpretation of content and location of copies of papers, books, abstracts, etc. and the reproduction of various types of document and the current bibliographic services for listing titles, abstracting and reviewing. These experts made various recommendations and the Branch now continues to develop this work.

A major sector of the program of the Branch concerns the assessment of the renewable resources of the world. The actual survey and assessment of these resources is primarily the responsibility of national institutions, but this responsibility is shared with the international fishery councils and commissions. However, there are international aspects of this work transcending even the regional boundaries and, in addition, the governments of the world assembled at the 7th FAO Conference felt the need for a world-wide view of this matter. The task of the Biology Branch is to encourage and assist the conduct of these surveys by national institutions, the compilation and review of information by the regional councils and commissions, and the eventual compilation of these data on a world basis. For this work the Branch is developing an active collaboration with the regional councils and commissions and, whilst making certain preliminary compilation, has sought their assistance in the development and review of these compilations.

In this field, the Branch has an opportunity through the FAO, Expanded Technical Assistance Program, to participate directly in survey work by appointing experts to assist governments who are anxious to learn more about their resources. It has appointed experts to assist in the survey of inland fisheries in Burma, the Dominican Republic, Guatemala, Haiti, Honduras, Iran and Paraguay. In respect of marine resources, it has appointed an expert to assist the governments of Costa Rica and Panama to obtain information on their shrimp resources ; other experts are assisting the governments of Brazil, Chile, Ecuador, Italian Somaliland, Saudi Arabia and Turkey in measuring their marine resources generally.

The other broad field of work on which the Branch is engaged, is concerned, through the use of information on the resources, in formulating and carrying through programs for the initiation, development, and management of fishing operations. The Branch is called upon from time time to advise on such work in member countries, with especial regard to the Technical Assistance projects being undertaken there. This work follows naturally from the initial task of assessing the renewable resources. For example, several years ago the Branch arranged for a reconnaissance survey to be made of the living aquatic resources of the inland waters of Haiti and, on the basis of information which was gathered, made recommendations to the Government of Haiti for the development of fisheries in these waters. Subsequently, technical assistance experts were assigned to that country to design and assist in carrying out the program of development which in-

cluded the establishment of pond culture and important activities in stocking and fishing natural waters. Similar work in inland fisheries was been done or is in progress in Burma, Ceylon, Egypt, Guatemala, Honduras, India, Indonesia, Iraq, Israel, Paraguay, Syria, Thailand and Yugoslavia. In addition to these individual country's projects, the Branch has been responsible for the conduct of training centers where government officials from several countries have been given instruction on their work of promoting the development of the inland fisheries of their countries. These centers have taken place in Indonesia and have been for countries of Asia and the Far East. A center for Near East countries has been proposed. The Branch has done similar work, in close collaboration with the Technology Branch of the Fisheries Division, in advising Member Governments on development of marine fisheries.

*Second Latin American Fisheries Training Center**

The closure in Mexico City on 10 December 1954 of the Second Latin American Fisheries Training Center, terminated a period of ten weeks intensive training in a wide field of fisheries subjects in which 45 nominees from 15 countries in the area participated. Compared with the First Latin American Fisheries Training Center, held in Valparaiso, Chile, January/March 1952, the Mexican Training Center placed more emphasis on the fisheries problems of the Central American and Caribbean area, especially Mexico, whence the majority of the participants came. Alike in their aim to give fishery administrators, technologists, biologists and economists, a general introduction to fishery science as a whole, the two Centers differed in method.

The availability, in printed form, of the lectures given at the Valparaiso Center made it possible to reduce the time spent on lecturing to only four weeks. In that comparatively short period not only/was the subject matter of the texts reviewed and discussed, but fields of study beyond the curriculum of the Valparaiso Center were also included. In this way, sufficient time was available for a comprehensive program of practical field work and seminar discussions. The former included biological and oceanographic work, practical fishing in fresh, brackish and marine waters, study of ice plants, fish markets and super-markets, as well as production of frozen and canned fish, fishmeal, dried shrimps and many other aspects of the processing and marketing of fish. Visits were paid to shipyards, a fisheries school, a can-making plant, a limnological station, a national center for technical education, a nautical school, a fishery inspector's office, and other places of interest, to provide a realistic background for the more specialized work undertaken in the biological, oceanographic, technological and economic courses. The trainees also had an opportunity to get acquainted with a wide range of geographical conditions and social environments in which the Mexican fisheries operate on the Atlantic

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* *See FAO Fisheries Bulletin*, VII (4), 182.

and Pacific coasts. The main centers of fishery activities in the Gulf of Mexico (Veracruz and Alvarado); on the Pacific coast (Mazatlan and Escuinapa); and in the hinterland (Lake Patzcuaro, the fish culture station at El Zarco, the net manufacturing plant at Guadalajara, fish markets in Mexico City, etc.) were visited during the field trips and illustrated a variety of conditions which lead to distinct forms of fishery development.

Seminars were organized during the last two weeks of the Center to discuss the basic characteristics of the Latin American fisheries. The seminars included discussions on working papers prepared by the instructors, and on the short reports presented by each of the trainees, referring to special problems in the development of the fisheries of his home country. These seminars were attended, not only by the trainees, but also by representatives of the industry and the press, and by officers from a number of government departments.

The papers presented by the instructors were:

Alvarez del Villar, J.	"Rural Fish Farming."
D'Alarçã o, J.	"Improving Latin American Fishery Statistics."
De Buen, F.	"The Living Aquatic Resources of the Gulf of Mexico and the Caribbean Sea."
Fridthjof, J.	"Increasing Fish Consumption."
Jul, M.	"Technological Aspects of Fisheries Development."
Mousinho de Figueiredo, J.	"Fisheries Extension Services."
Osorio-Tafall, B.F.	"The Fisheries of the Mexican and Central American Pacific Coast."
Paz-Andrade, V.	"Marketing Fish Commodities and Market Outlook in the Region."

The participants contributed 42 papers, comprising 15 biology, 6 technology, 11 economics, 2 statistics, and 8 on administration. The lecturers were provided by the Government of Mexico as follows:

José Alvarez del Villar,
Chief, Commission for Rural Fish Culture,
Department of Fisheries.

Hector Medina Neri,
Industria Nacional Químico-Farmacéutica,
Mexico, D.F.

Luis Sanchez,
Director of Co-operatives,
Ministry of Economics.

Jesús Diaz Barriga,
National Institute of Nutrition
Mexico, D.F.

Pedro Mercado,
Biologist, Department of Fisheries.

Enrique Rioja,
Institute of Biology,
University of Mexico.

Jorge L. Tamayo,
Professor of Economic Geography,
School of Economics,
University of Mexico.

A group of lecturers and trainees at the Second Latin American Fisheries Training Center, Mexico City.

1. Samuel S. Solis (Mexico).
2. Fausto Echeverria (Honduras).
3. Felix Iñigo (Puerto Rico).
4. Alvaro Perez (Colombia).
5. B.F. Osorio-Tafall (FAO).
6. Milton J. Lindner (U.S.A.).
7. Gonzalo Guzman (Ecuador).
8. Fernando de Buen (Mexico).
9. Enrique Rioja (Mexico).
10. Jose Mousinho de Figueiredo (Portugal).
11. Pedro Sosa (Ecuador).
12. J. Angel Coto (Costa Rica).
13. Guillermo Gonzalez (Guatemala).
14. J. Eleno Abad (Panama).
15. Pedro Mercado S. (Mexico).
16. Raul Ricord (Panama).
17. Heriberto Uribe (Mexico).
18. Ignacio Delgado (Mexico).
19. J. Alvarez del Villar (Mexico).
20. V. Manuel Urroz (Nicaragua).
21. Jose Luis Valero (Mexico).
22. Ruben Camacho (Nicaragua).
23. Miguel Morales (Guatemala).
24. Fernando J. Guardiola (Colombia).
25. Rafael Vega (Mexico).
26. Marco H. Boquin (Honduras).
27. Manuel A. Villalta (El Salvador).
28. Tomas de Rueda (Mexico).
29. Emmanuel Garnier (Haiti).
30. Leonce Bonnefil (Haiti).
31. Jorge Hernandez (Mexico).

Trainees who attended the Center, but are not in the picture were : Geneville Hermsdorff, Campo Elias Medina, Milton López, Adolfo Naranjo, Moisés Hernández, Ulises Moreno, Emma Cardiel de Sánchez, Silvestre Chavez, Roberto de la Cruz Carrillo, Hugo Loredo, Edgardo Medina, Juana Navarro, Fernando Obregón, Alfredo Ortiz de Zárate, Vicente Ramírez, Modesto Saenz, Justino Sánchez, Jesús Saucedo, Juan Luis Obarrio, Mario Siri.

The lecturers, sponsored by FAO, were:

J. d'Alarção,
Economist,
Fisheries Division.

J. Fridthjof,
Fisheries Economist,
FAO Regional Office,
Mexico, D. F.

Mogens Jul,
Director,
Slagtiernes Forskningsinstitut,
Roskilde, Denmark.

M. Martinez del Campo,
Industrial Research Officer,
Bank of Mexico, Mexico, D. F.

J. Mousinho de Figueiredo,
Interim Bureau Chief,
Direcçao Geral Serviços Pecuários,
Lisbon, Portugal.

V. Paz-Andrade,
General Advisor,
Associación de Industrias,
Conserveras y de la Unión,
Española de Armadores Pesqueros,
Vigo, Spain.

Fernando de Buen,
Fisheries Biologist,
Mexico, D. F.

L. E. Heyson,
FAO Agricultural Economist,
FAO Mission, Mexico

M. J. Lindner,
U. S. Fish and Wildlife Service,
Technical Advisor on Fisheries,
U. S. Embassy, Mexico, D. F.

R. Millares Sotres,
Technical Director,
Maiz Industrializado S. A.,
Mexico, D. F.

B. F. Osorio-Tafall,
Regional Fisheries Officer for
Latin America,
Santiago, Chile.

Jan-Olof Traung,
Naval Architect,
Fisheries Division.

The Director of the Center was Manuel Torres Torrija, of Mexico - Dr. B.F. Osorio-Tafall, FAO Regional Fisheries Officer for Latin Amer; ica, Santiago, acted as co-director, and P. de la Fuente, also of the FAO Santiago Office, as Administrative Assistant.

At the closing session, the Director of Fisheries, who also represented the Minister of the Navy, presented certificates to the 39 trainees who had attended the whole course of instruction. Representative of the Ministry of Economics and other ministries were also present. The closing speeches were delivered by the Director and Co-Director of the Center, and by Silvestre Chavez Perez, who spoke on behalf of the participants. The work of the Center was reviewed and discussed, and confidence was expressed in the practical advantages which will derive from bringing together in Mexico, through this Center, experts in such varied fields, to study the manifold problems involved in improving the Latin American fisheries.

FAO *Yearbook of Fishery Statistics 1952-53* (Part 1)

The FAO *Yearbook of Fishery Statistics 1952-53* Vol. IV, Part 1, has now been published.

The first Yearbook was issued in 1947 by the FAO Fisheries Division, and since then it has been gradually enlarged and developed. This year, for the first time, it is being published in two parts. Part 1 deals with production and craft ; Part 2, to be published later this year, will deal with trade (imports and exports). The Foreword states :

> The division of the Yearbook into two parts allows production statistics to be published fairly promptly and, if desired, more frequently than in the past. The aim of the Yearbook is not to be a substitute for national statistical publications, but to group and present national data in such a fashion as to make global and regional analyses possible, to provide a comprehensive background against which national fishery statistics can be viewed, and to facilitate international comparisons.

The Yearbook (Part 1) is divided into four sections : Catch and Landings, Utilization, Fishing Craft, and Historical Summaries. It is printed in English and French, with some of the explanatory text in Spanish, and contains 69 statistical tables based on information gathered from more than 160 different countries and territories, interpretive notes, an index of countries and a glossary of scientific fish names attached to the tables. The catch and landings section deals with the world catch of fish, crustaceans, mollusks, etc., which is analyzed by group of species, fishing areas, continents, regions and, in greater detail, by countries. The last six tables in this section show, for each continent, the value of landings by countries and species in terms of national currencies and U.S. dollars.

The total world catch of fish, crustaceans, mollusks, etc., in 1953, was estimated at over 27,000,000 metric tons live weight, more than in any previous year. The catch was made up as follows : fresh-water fishes, 3,000,000 metric tons (11% of total) ; salmon, trout, smelts, etc., 600,000 tons (2%) ; flounders, halibuts, soles, etc., 800,000 tons (3%) ; cods, hakes, haddocks, etc., 4,000,000 tons (15%) ; herrings, sardines, anchovies, etc., 6,500,000 tons (24%) ; tunas, bonitos, mackerels, etc., 1,800,000 tons (7%) ; miscellaneous marine teleosteans 5,500,000 tons (20%) ; sharks, rays, etc., 500,000 tons (2%) ; crustaceans, 800,000 tons (3%) ; mollusks, 2,500,000 tons (9%) ; other species, 1,100,000 tons (4%).

Compared with the estimated total world catch in 1938, the figure for 1953 shows an increase of over 20%. Additional information is shown for a group of countries for which more detailed figures are available and which, in 1953, accounted for 17.4 million tons, or nearly two-thirds of the estimated world total. In this group there has been an over-all increase in catches by more than 35% between 1938 and 1953 spread over all species groups except salmon, etc., where a decline in the Alaska catch, together with the transfer of the bulk of the North-

west Pacific salmon fisheries from Japan to the U.S.S.R. resulted in a reduction of the recorded catch from 670,000 metric tons in 1938, to 330,000 tons in 1953. Other comparisons for the selected group of countries, 1938 figures being given first, are (in metric tons) : freshwater fishes, 600,000 to 730,000 ; flounders, halibuts, soles, etc., 300,000 to 470,000 ; cods, hakes, haddocks, etc., 2,890,000 to 3,320,000 ; herrings, sardines, anchovies, etc., 4,260,000 to 5,260,000 ; tunas, bonitos, mackerels, etc., 610,000 to 1,150,000 ; miscellaneous marine teleosteans, 1,300,000 to 3,000,000 ; sharks, rays, etc., 200,000 to 250,000 ; crustaceans, 340,000 to 460,000 ; mollusks, 1,040,000 to 1,700,000 ; others, 500,000 to 700,000.

The utilization section consists of tables presenting data on the disposition of the catch by groups of species and countries, together with 22 commodity tables dealing with the output of preserved and processed commodities.

In the next section, fishing craft are listed by categories characteristic of national classification, while in the last section historical summaries, which have been compiled and published for the first time, are offered as an aid to research workers. In this section are published the available data on fish landings from 1910 to 1953, in eight tables, one for each continent and two for the whale catch, by area, country and species.

The FAO *Yearbook of Fishery Statistics 1952-53*, Vol. IV, Part 1, is available from any of the official sales agents listed on the inside back cover of the *FAO Fisheries Bulletin*, or directly from FAO Headquarters, Rome (US$3.00 or 15*s*., post free).

Expanded Technical Assistance Program

Resumé of progress in fisheries

Brazil. W.E. Ripley (U.S.A), marine fishery biologist, arrived in Rio de Janeiro on 10 January, and after discussions with the Director of the Federal Fisheries Department, assumed duty at the Marine Fishery Research Institute, Santos, where he will be working with the scientific staff on the description and assessment of fisheries resources.

Robert E. Lee (U.S.A.), fishery engineer, arrived in Brazil in February to begin his assignment in the State of Pernambuco, to carry out a program of exploratory fishing out of Recife, with special referenc to albacore and tuna resources.

A fishery technologist is being recruited to advise on programs of work being carried out in federal and state fishery technological laboratories.

Two further experts are being recruited to assist the Superintendencia do Plano de Valorização Económica da Amazonia (SPVEA) (Superintendency for the Economic Development of the Amazon Region) ; the one, a specialist to help formulate an over-all program for fishery development and administration, and advise on gear ; this post

will be implemented on notification that the Superintendency has signed the agreement and the local arrangements have been made. The other post is for a fishery technologist to introduce improved fish processing and preservation methods. The latter is a supplementary post, and will be implemented when and if funds permit.

Burma. A fish culturist will be recruited for a 12 months' assignment in Burma as a supplementary post if funds permit, to follow up on the survey made by Dr. S.W. Ling in 1954. His report on this survey has been issued and sent to the Government.

Ceylon. Einar Kvaran (Iceland), marine engineer, reports the delivery of 40 small engines, provided by the Colombo Plan, for installation in local fishing craft. He is advising the Government and the Plan Committee on the choice of craft from the technical point of view, and on the details of the installation of the engines.

Mr. Kvaran and Jon Saemundsson (Iceland), Fishery Engineer, have been working together on the development of a power-driven winch for hauling beach seines. Mr. Saemundsson, after visiting several parts of the island where different fisheries are located, proposes to add experimental purse seining to his program of small craft mechanization and exploratory fishing. An independent operator, with the expert's advice, is also experimenting with a purse seine.

Dr. S.W. Ling (China), inland fishery biologist, arrived in Ceylon on 1 February and is reviewing the possibilities for developing fish culture and the more effective use for the production of fish of artificial and natural waters in the country.

A fishery economist may be recruited if found desirable and funds permit, as a supplementary post in 1955.

Chile. Karl Olesen (Denmark), fishery engineer, has been supplied with an echo sounder by FAO, and is demonstrating its use. He has had success with artificial trolling lures in catching tuna and kingfish, and has been demonstrating the use of a line hauler, also supplied by FAO, for use in raising bottom set long lines. Local fishermen have hitherto been hauling up their long lines by hand.

N.P. Hansen (Denmark), fish handling technologist, arrived in Santiago on 5 December 1954, and has visited several widely scattered fishing ports. He finds fish distribution a limiting factor on production, and hopes to introduce fish handling techniques to achieve a wider and more efficient distribution of fresh fish. He is also advising several operators on fish smoking methods.

A. Bories, Fellow in fish handling and processing, is continuing his studies in Spain, Morocco and the Canary Islands after visiting FAO Headquarters on his return from Norway and Denmark.

M. Montt, Fellow in fishery economy, concluded his twelve months' program of training in Europe with a course of studies in Spain and Portugal and has returned to Chile to assume duty as Economic and Legal Advisor to the Directorate-General of Fish and Game, Ministry of Agriculture. He has submitted to his government a full report of

his work in Europe, with suggestions for possible lines of development in Chile.

Prof. J.N. Bahamonde, Fellow in marine fishery biology, has left Rome, after briefing, for Norway, where he will be working in Norwegian fishery research institutions on important commercial species of fish. This is a 12-month fellowship, part of which will be spent in Sweden, Denmark and the United Kingdom.

Colombia. Dr. V. Paz-Andrade (Spain), fishery economist, arrived in Colombia on 15 February to assume duty advising the Government on strengthening and improving the organization of the Fisheries Department, and advising on measures to promote increased efficiency in commercial fishery industries. This is a four-month assignment and will be followed by a second appointment for a further period of twelve months.

Costa Rica. Martin Burkenroad (U.S.A.), shrimp biologist, when in Costa Rica in September and November 1954, made plans for further visits in 1955. Mr. Burkenroad hopes to return to Costa Rica to develop a program for the assessment of shrimp stocks similar to the work he is carrying out in Panama.

Curaçao (Netherlands Antilles). A fishery consultant is being recruited to visit Curaçao for three months to advise on the possibility of establishing a trawling industry.

Denmark. Plans are going forward for a training center to be held in Denmark for six weeks from 28 August 1955, designed primarily for fishery administrators from certain underdeveloped countries.

Dominican Republic. The report of S. Y. Lin on his fish culture project has been completed and sent to the Government.

Ecuador. Karsten Hoydal (Denmark-Faroes), fishery technologist, has been supervising the installation of a fish meal plant at Manta, and the installation is now being tested ; he is advising on the design and erection of fish refrigeration and drying plants. A request has been received from the Government for the assignment of a fishery economist to advise on the development of fish distribution and processing projects, especially freezing plants and salting and drying projects. This project will be implemented if funds permit.

C. Reyes-Vandenberg, Fellow in fishery biology, returned to Ecuador in January 1955 on the completion of his studies in France.

G.J. Mignone expects to take up his six months' fellowship for study in fishery technology in Canada in May 1955.

A report by Dr. Erwin Schweigger (Peru), fishery biologist, on his ETAP Mission has been completed and forwarded to the Government.

Funds permitting, a fishery economist will be provided for Ecuador this year to assist and advise on a fish processing development program.

Egypt. K.W. Jensen (Norway), inland fishery biologist, is working with a team of Egyptian fishery scientists on the assessment of the fundamental production of a large artificial sheet of water near Alexandria known as the hydrodrome. Length frequency measurements are being accumulated, and hydrographical and biological observations are being carried out systematically.

Finland. Funds permitting, a water pollution consultant will be provided in 1955 to advise and assist on policy matters related to the control of industrial pollution in natural waters of the country, and measures necessary to abate water pollution nuisance for the protection of fish life. He will also lecture on water pollution problems. One fellowship for studying water chemistry will also be provided, funds permitting.

Guatemala. S.Y. Lin (China) remained in Guatemala until the end of February carrying out a general survey of the inland fisheries and the possibilities for fish culture. His report is awaited. He will return later this year to start putting his program of work into effect.

Haiti. A report prepared by Shimon Tal (Israel) on his fish culture project is now in preparation. A fishery engineer is being recruited this year for a 9-month assignment.

Honduras. S.Y. Lin (China) returned to Honduras from Guatemala in March and started a program of work in selected areas on inland fishery and fish culture projects which were decided upon during the survey he carried out in 1954.

Hong Kong. Some of the lecture material and summaries of certain of the seminars which took place at the First International Fish Marketing Training Centre in August 1954 are being prepared for publication. It is proposed to issue these results in three parts : Part I, a report on the administration and organization of the Center ; Part II, a consolidated summary of fish marketing conditions in the Indo-Pacific Region as exposed by the seminars ; and Part III, a detailed account and analysis of the organization and operation of the Hong Kong Fish Marketing Organisation.

India. Paul Ziener (Norway), naval architect, has completed the work he undertook after local leave at the year-end in the States of Bombay, Saurashtra and Kutch, and he then visited Calcutta. Later he is due to join G. Illugason (Iceland), in the State of Andhra. He is also engaged in finalizing his design for a second surf boat for use off the Madras coasts, and his proposed visits to West Bengal and Orissa will complete a very full schedule of work up to mid-summer, 1955. The main emphasis of his work lies in the design of craft based on traditional local types which can carry engines, and which can operate more powerful gear, and in designing and trying out motor fishing craft to operate from India's long surf-bound coasts.

Mr. G. Illugason, fishery engineer, will work together with Mr. Ziener in Andhra during a visit in March-April ; he will then return

to Madras where several crews of Indian craftsmen are developing different fishing methods under his guidance. As a demostration, five small mechanized open boats with Indian craftsmen are fishing successfully with bottom-set nylon gill nets under his supervision, catching 4,000 to 6,000 lb. of fish per month ; this gear could readily be used by many other local craft. Due to the successful operation of these boats, several private fishermen have expressed their interest in acquiring similar boats and nets, and it is hoped that in due course means may be found to make this possible. Powered line haulers supplied by FAO are being used in long lining for shark and other fish, and a small purse seine is being made up with which it is hoped to catch Indian mackerel during the forthcoming season. Trawling for prawns with the 22 ft. Danish boat in Tellicherry on the west coast has been very successful ; catches of 300 to 500 lb. per day are being taken.

The following experts are being recruited : a fishery engineer for the State of Saurashtra ; a fish harbor specialist ; a fishery technologist ; a specialist to organize a national training center for master fishermen : and an inland fishery biologist for the State of Orissa.

A report entitled " Development of the Sunderbans Fisheries of West Bengal, " based on the ETAP Mission of W.F.L. van der Heyden (Netherlands) has been forwarded to the Government of India.

Indonesia. An expert is being recruited to help the Government reorganize their training program on the theory and practice of inland fisheries and fish culture.

The Third International Training Center in Pond Fish Culture in Fresh and Brackish Water will be held in Java and Madura by invitation of the Indonesian Government in the autumn.

Iran. Harald Fibiger (Denmark), fishery engineer, arrived at Bandar Abbas, Iran, in the FAO tuna fishing vessel *New Hope* on 17 December, 1954, after carrying out a refit of the vessel in Aden. A program of exploratory fishing in the Gulf of Oman and Persian Gulf has begun. This is a co-operative project between the Iran 7-year Plan Organization, the Iran-American Joint Fund for Agriculture, USFOA and FAO.

Iraq. A. van den Eelaart (Netherlands), inland fisheries biologist, since his arrival in Iraq in November, has gathered preliminary data on length, weight, etc. of important species of fish. His present program of work arises out of some of the recommendations he made on completion of his 1952/53 mission, the report of which has been forwarded to the Government.

An engineer to advise on the design and construction of fish passes will be recruited as a supplementary post, if funds permit.

Israel. A report entitled " Inland Fisheries, " based on work carried out by A.E. Hofstede (Netherlands) has been forwarded to the Government ; this summarizes the results of his work on Lake Tiberias and fish culture.

M. Ehrlich began his studies under an FAO/ETAP fellowship in Portugal on deep sea trawler management, including the taking, handling, carrying and reception of catches. This fellowship has, unfortunately, been interrupted through a family bereavement. It is hoped he will be able to resume work later on.

R. Ruppin has taken up a fellowship to study methods of fishery education in north-western Europe, having initially reported to Rome on 8 February for briefing.

Liberia. Knud Frederiksen (Denmark), fishery engineer, after arrival in Monrovia in December, refitted the 22 ft. (not 24 ft. as stated in FAO *Fisheries Bulletin* Vol. VIII, N° 1) Danish-built, FAO motor fishing boat. He has since made an extensive cruise covering the whole coast of Liberia, carrying out shallow water trawling operations at various points : results were disappointing, except near certain river mouths.

Libya. A consultant is being recruited to carry out a reconnaissance survey of possibilities developing a marine fishing industry.

Mexico. John Fridthjof (Denmark), fishery economist, after serving as an instructor at the Training Center, has launched, with keen support from many government agencies, a program of education and publicity to increase the domestic consumption of fish. His projects include a pilot project for the sale of dried fish in Mexico City, the organization of " fish work units " in the schools and the setting up of local committees including fisheries, education, public health and social workers in certain selected areas. He is also making a study of distribution costs in collaboration with the Ministry of Economics and the Bank of Mexico. In co-operation with the Nutrition Division, FAO, he is assisting the Ministry of Health with the experimental introduction of fish flour as a protein ingredient in popular foods.

Funds permitting, an expert will advise and assist in promoting the more orderly marketing and distribution of fisheries products among the people of the country, ancillary to Mr. Fridthjof's work.

Panama. Martin Burkenroad (U.S.A.), shrimp biologist, has continued to develop his program of work in Panama, with a team of Panamanian scientists, and is now working on the problems of the management of shrimp stocks. Mr. Burkenroad has prepared a paper for a Panamanian publication on the purpose and methods of the work he and his team are carrying out, and the type of results which may be expected in attempting to define the magnitude of the available stocks of shrimp. He is also preparing a series of definitions of the species of shrimp of commercial importance in Panama. The report on L. W. Scattergood's preliminary shrimp investigations has been forwarded to the Government.

Paraguay. An inland fishery biologist is being recruited for mid-1955, to review the possibilities for developing the inland fisheries.

Saudi Arabia. G.G. Ferrer (Philippines), fishery engineer, has carried out some further exploratory fishing, consisting mostly of trolling demonstrations. He has also acted as technical advisor to the semi-official Saudi Fishing Company which is preparing a large-scale operation. In this connection, he has traveled to Egypt to advise on purchase of equipment.

A report on "The Possibilities for Development of Marine Fisheries," by Dr. M.K. el Saby and Mr. Luigi Farina, has been completed and forwarded to the Government.

Somalia. Funds permitting, it is proposed to resume in the autumn of 1955 the fishery exploratory survey, carried out by FAO and the Administration of Somalia in the fishing season 1952/53. This work would not be restricted, as was the case with the first survey, to the tuna fishery off the north coast (Gulf of Aden), but would extend mainly to the east and south-east coasts.

Syria. Recruitment is in progress for a fish culturist and a fishery engineer.

Thailand. Dr. S.W. Ling (China), inland fishery biologist, concluded his four-year mission in Thailand in January 1955. A report is in preparation on the results achieved in this long and highly successful assignment, during which the use of Tilapia in fish culture became widely practised among peasant farmers in many parts of the country ; efficient extension services were developed and a considerable number of Thai fishery officers were trained or received a supplement to their training in practical fish culture techniques. A request has been received from the Government for assistance in fish preservation technology.

A report by Dr. G.L. Kesteven on the Indo-Pacific Fisheries Statistics Training Center held in Bangkok in 1952, has been forwarded to the governments concerned.

Turkey. Olav Aasen (Norway), marine fishery biologist, has been assisting the Government in the creation of a fishery research center at Istanbul under the Meat and Fish Office. This Center will carry out a program of applied fishery biological research co-ordinated with the Oceanographic Institute which, for the most part, undertakes fundamental studies. Mr. Aasen has carried out a second and much more extensive Black Sea cruise in the research vessel *Arar*, during which schools of palamut (bonito) were found on Asdic and identified. Hydrographic data were also collected.

Jon Einarsson (Iceland), fishery engineer, arrived in January and has been engaged in preparing the Pacific-type purse seine vessels belonging to the Meat and Fish Office for purse seining, and in modifying gear in preparation for the hamsi (anchovy) fishing. He has been joined on this project by R. Gudmundsson (Iceland).

Recruitment is in progress for a fish marketing specialist.

C. Renda concluded his fellowship in fish marketing in Denmark, Germany, Norway and the United Kingdom, and passed through Rome early in March to discuss future developments in Turkey.

The report on Dr. Rounsefell's preliminary investigations in fishery biology is in preparation, as is that on G.S. Napier's (U.S.A.) fishing project and H. Henriksen's (Norway), economic project.

Yugoslavia. Sigurd Nielsen (Denmark), fishery engineer, has taken delivery of the FAO "wing trawl," that is a high-opening trawl as used for herring and sprat in the North Sea. This gear was demonstrated during the last few weeks of his assignment.

In January, H. Lisac concluded his studies on fish processing technology in Germany.

Mrs. Mihajlovič-Babuder terminated her studies on fish pathology in Germany in February.

A fellowship has been awarded to I.J. Tilič, whose studies in fisheries economics are expected to start in Norway in mid-May, followed by further studies in Denmark, the Netherlands and Germany.

An inland fishery biologist will be recruited as a supplementary post if funds permit.

The final report on Mr. Fridthjof's work to expand fish consumption is in preparation.

Current Fisheries Literature

Selected Publications

FWS 9.3 FISHERY PRODUCTS, LAWS AND REGULATIONS UDC 34:637.56

Food and Agriculture Organization of the United Nations. *Food and Agricultural Legislation*, Vol. 3, No. 2. Rome, Italy. 23 pp. In English, French and Spanish.
1954

Contains Danish regulations regarding control of fish and fisheries products. The regulations include special rules relative to : imported fish and fisheries products ; storage and chilling of fish and fisheries products ; transport ; sanitation aboard boats and in fresh fish plants ; sale of fish and fisheries products ; licensing of undertakings and vessels in which fish and fisheries products are processed or frozen or otherwise pre-treated for commercial purposes ; also special provisions relative to certain undertakings such as canned and semi-preserved foods, etc. and fish meal manufacture. The regulations concerning a Quality and Appeals Committee, which is to be set up, inspection, fees, penalties, etc., are also given.

FWS 9.1 MARINE BIOLOGY — ANTARCTIC OCEAN UDC 57(269)

Baker, A. de C. The Circumpolar Continuity of Antarctic Plankton Species. *Discovery Reports*. Cambridge University Press, Bentley House, 200 Euston Road, London, N.W. 1. Vol. XXVII. pp. 201-218, tables, figs., bibl. In English. Price : 6*s*.6*d*.
1954

It has been suggested that, as the Southern Ocean is an uninterrupted circumpolar belt with more or less uniform conditions prevailing in east and westerly directions, the range of planktonic species of the Antarctic surface water may be expected to extend as far as these uniform conditions persist, i.e. to be circumpolar.

Dr. Hart (*Discovery Report* XXI, 1942, pp. 261-356), has shown this to be true of the important phytoplankton species and discusses the reasons for the few gaps that appear when the selected data are plotted. The same is shown for the larger zooplankton species and an indication of the degree of accuracy of the specific identification is given. Histograms are drawn which demonstrate the occurrence of each species in a circumpolar direction and show the percentage of samples in which the species occur.

FWS 1.8 MOLLUSKS — SOUTH ATLANTIC OCEAN UDC 594(264)

Morton, J.E. The Pelagic Mollusca of the Benguela Current. Part 1. First Survey, R.R.S. *William Scoresby*, March 1950, with an account of the reproductive system and sexual succession of *Limacina bulimoides*. *Discovery Reports*. Cambridge University Press, Bentley House, 200 Euston Road, London, N.W. 1. Vol. XXVII. pp. 163-200, figs., tables, bibl. In English. Price : 12*s*.6*d*.
1954

Systematics, and depth distribution.

FWS 1.1 TUNAS, MACKERELS, ETC. UDC 597.5

Godsil, H.C. A Descriptive Study of Certain Tuna-like Fishes
1954 *Fish Bulletin* No. 97, State of California, Department of Fish and Game, California, U.S.A. 186 pp., tables., figs., illus., bibl. In English.

An analysis, primarily, of anatomical and meristic characters carried out to provide a basis for discussion on which fish are to be included under the common name 'Tuna.' Concludes that the name is biologically valid only for Thunnidae, or Thunnidae and Katsuwonidae. Discusses relationships of these 'families,' and the tuna-like *Sarda* and *Pneumatophorus*.

FWS 1.5 COD, HAKE, ETC. UDC 597.5

Jones, R. The Food of the Whiting, and a Comparison with that
1954 of the Haddock. *Marine Research* 1954 No. 2, Scottish Home Department, H.M. Stationery Office, 13a Castle Street, Edinburgh, Scotland. 35 pp., tables, figs. In English. Price: 7*s.*

Stomach analyses show that the whiting, *Gadus merlangus* L., is a predator, feeding mainly on fish and active crustacea (increase in the proportion of fish eaten will increase its size), whereas the haddock, *Gadus aeglefinus* L., is more exclusively a bottom feeder on echinoderms, annelids, mollusks and crustacea, and exercises less selection in diet. There is no evidence of serious food competition between the two species, nor of predation.

FWS 1.9 WHALES, DOLPHINS AND PORPOISES UDC 599.51

Brown, S.G. Dispersal in Blue and Fin Whales, *Discovery Reports*,
1954 Cambridge University Press, Bentley House, 200 Euston Road, London, N.W. 1. Vol. XXVI, pp. 355-384, figs., tables. In English. Price: 12*s.* 6*d.*

A summary of analysis of marking experiments in the Antarctic conducted between 1932 and 1939, with returns up to the 1951/1952 season. Complete tables of the data are given and movements of whales between the different whaling areas are discussed.

FWS 2.115 NAVAL ARCHITECTURE UDC 629.12

Handbuch der Werften [The Shipyard's Handbook] 1954. Schiff-
1954 fahrts-Verlag *Hansa*. C. Schroedter & Co., Hamburg 11, Germany. 389 pp., illus., index. In German. Price: DM. 25.

The third edition of the yearly textbook of principles of naval architecture [for a review of the first edition *see FAO Fisheries Bulletin*, IV (3), 46].

FWS 1.0118 FISHERIES - U.S.A. UDC 639.2 (73)

Langlois, Thomas H. The Western End of Lake Erie and its Ecol-
1954 ogy. J.W. Edwards, Publishers, Inc., Ann Arbor, Mich., U.S.A. xx + 479 pp., fig., bibl., index. In English. Price: US$10.00

The author considers that the shallow western basin of Lake Erie is a "key area for starting the conversion process which culminates in the crops of fish;" this is a report on that "key area." After a historical introduction, the book deals systematically with the physical environment, the biota and the fisheries, and finishes with a chapter on fish management.

United Kingdom. Production of Fish in the Colonial Empire. 1954 H.M. Stationery Office, York House, Kingsway, London W.C.2. Colonial Office, Revised Edition. Colonial No. 300. 22 pp. In English. Price : 9*d*.

Gives brief accounts of fishery development and research in the various British colonial territories, prepared by C.F. Hickling on the basis of reports from the territorial governments and from research stations. The introductory paragraphs discuss, generally, the work of the colonial fishery officers and the problems of fishery development work.

FWS 9.10 FISHERIES RESEARCH, BIOLOGICAL UDC 639.2.001.5

Investigaciones Zoológicas Chilenas, Vol. 2, No. 2, December. Casilla 1953 147, Santiago de Chile, Chile. 31 pp., fig., tables. In Spanish, with short English and German summaries.

The second paper, pp. 23-30, " Alimentación de la merluza de los canales [*Merluccius australis* (Hutton), 1872], con datos biométricos de los ejemplares, " by Nibaldo Bahamonde N., is of interest to fisheries workers. Gives analysis of stomach contents of 625 fish, presented as a table of percentage frequency of occurrence, together with some other biometric data.

FWS 1.8 FISHERIES INDUSTRIES - CRUSTACEANS - U.S.A. UDC 639.28 (73)

Wharton, J. The Chesapeake Bay Crab Industry. *Fishery Leaflet* 1954 358 (Revised). U.S. Department of the Interior, Fish and Wildlife Service, Washington 25, D.C., U.S.A. 17 pp., illus., monolith. In English.

The leaflet describes in considerable detail the principal gear and methods of capture used in the Bay, such as the dip net, push net, scrape, fyke, haul seine, pot, dredge and trotline, all illustrated by sketches. A brief description is also given of the shedding, packing, freezing, canning, and other preparations and handling of the crab meat.

FWS 2.6 FRESH FISHERY PRODUCTS - DISTRIBUTION UDC 664.951.037.17

Garfield, M.J. Indexes of Transportation Rates for Fishery Prod- 1953 ucts, *Circular* 23, U.S. Department of the Interior, Fish and Wildlife Service, Washington 25, D.C., U.S.A. 13 pp., illus. In English. Price : US$10.00

Presents tables showing indexes of rates for the transportation of fisheries products by rail freight, rail express, and motor carrier, between points in the United States, constructed on the basis of 1947 = 100. Separate indexes for canned fish products, fish meal, fish oil and fresh and frozen fish are included, as well as composite indexes. Some regional indexes are also shown. A supplementary table gives estimated quantities of fisheries products carried by the three principal types of transportation, for the years 1935-1952. The emergence of the motor carrier as an important and relatively inexpensive means of transportation is clearly shown.

Clarke, R. 1954 OPEN BOAT WHALING IN THE AZORES. THE HISTORY AN PRESENT METHODS OF A RELIC INDUSTRY. *Discovery Reports* Cambridge University Press, Bentley House, 200 Euston Road London, N.W.1. Vol. XXVI. pp. 281-354, figs., tables, plates In English. Price : 21*s*.

Gives an account of the origins, history and present methods o whaling in the Azores, and describes the boat, gear and operation Includes a statistical table of catches of sperm whales in the Azore made for each year from 1896 to 1949. A list of references on whal ing is also included.

Other Books Received

British Fisheries Directory and Buyers Guide, Piscatorial Press Ltd. 1954 68 Victoria Street, London, S.W.1. 432 pp. In English.

Collins, G.B. 1952 FACTORS INFLUENCING THE ORIENTATION OF MIGRATING ANADROMOUS FISHES. *Fishery Bulletin* 73, U.S. Department of the Interior, Fish and Wildlife Service, Washington 25, D.C. U.S.A. Vol. 52, 22 pp., illus., tables. In English. Price US$20.00.

Howard, Gerald V. 1954 A STUDY OF POPULATIONS OF THE ANCHOVETA *Cetengraulis mysticetus*, BASED ON MERISTIC CHARACTERS. *Bulletin*, Inter-American Tropical Tuna Commission, La Jolla, Cal., U.S.A. Vol. 1, No. 1, 24 pp., fig., tables, bibl. In English, with Spanish summary.

Mendis, A.S. 1954 FISHES OF CEYLON. A CATALOGUE, KEY AND BIBLIOGRAPHY. *Bulletin No.* 2, Fisheries Research Station, Department of Fisheries, P.O. Box 531, Colombo, Ceylon. 223 pp., illus., bibl. In English.

Navaz y Sanz, J.M. 1953 Estudio elemental de la pesca y sus problemas [ELEMENTARY STUDY OF FISHING AND ITS PROBLEMS]. Ministerio de Marina, Madrid, Spain. 93 pp. In Spanish. Price : 6 pesetas.

NOTES ON THE USE OF THEORETICAL MODELS IN THE STUDY OF THE 1954 DYNAMICS OF EXPLOITED FISH POPULATIONS. *Miscellaneous Contributions* No. 2, U.S. Fishery Laboratory, Beaufort, N. Car., U.S.A. 187 pp., figs., tables. In English.

Williams, R.W., Eldridge, W.E., Mains, E.M. and Lasater, J.E. Toxic 1953 EFFECTS OF SULPHITE WASTE LIQUOR ON YOUNG SALMON. *Research Bulletin* No. 1, State of Washington, Department of Fisheries, 1308 Smith Tower, Seattle, Washington D.C., U.S.A. 111 pp., tables, figs. In English.

Journals and Periodicals

Bamidgeh, Monthly Bulletin of Fish Culture in Israel. Fisheries Depart- 1953 ment, Ministry of Agriculture, Hakirya, Israel. In Hebrew and English.

WIRZHUBSKI, A., and SARIG, S. " Carp Breeding in Fish Ponds with the Aid of Intensive Fertilization but Without Additional Feed " (Vol. 5, No. 3-4).

HEPHER, B. " Problems of Fertilization of Fish Ponds-Lime " (Vol. 5, No. 5-6).

BEN-ARI, A. " Experiment in Early Spawnings, carried out in Upper Galilee " (Vol. 5, No. 5-6).

Sarig, S. "The Utilization of Fish Pond Areas in Winter" (Vol. 5, No. 5-6).

———. "Prevention of Mass Mortality of Fry in Spawning Ponds" (Vol. 5, No. 7-8).

———. "On Feeding with Lupine" (Vol. 5, Nos. 7-8).

Bondi, A., and Spandorf, A. "The Action of the Digestive Enzymes of the Carp" (Vol. 5, No. 7-8).

oletin del Instituto Español de Oceanografía, Ministerio de Marina, Ma-
1953 drid, Spain.

Andreu Buenaventura. "Sobre la relación entre el número de branquispinas y la talla en la sardina (*Sardina pilchardus*, Walb) española" (No. 62).

Concludes that it is not possible to discriminate between Atlantic and Mediterranean pilchard (*Sardina pilchardus* or *S. sardina*) on the basis of morphology of gill raker denticles. The number of gill rakers depends on the size of fish.

Oliver, Miguel Massuti. "Bionomía de los fondos de 300 a 600 metros en el Sur y Suroeste de Mallorca" (No. 63).

A short, general account of fishing operations and species caught, with notes on length distributions and stomach contents.

ournal of the Marine Biological Association of the United Kingdom,
1954 Cambridge University Press, Bentley House, 200 Euston Road, London, N.W.1. Vol. XXXIII. No. 3. 808 pp., figs., tables bibl. In English. Price: 40*s*.

Among the 16 papers comprising this number, which also includes wo book reviews and a report of the Council, the following are noted.

"The Mixing and Movement of Water in the Estuary of the 'hames," by W.S. Preddy. A method of representing the mixing of water n an estuary is given, and the amount of mixing which occurs in the 'hames estuary is calculated. Changes in salinity predicted from the esults are found to agree with observation. The application of this heory of mixing to some pollution problems is briefly considered.

"Thyroidectomy of the Dogfish, *Scyllium canicula* (L.), and the Effect of Dogfish Thyroid upon the Oxygen Consumption of Rats," y A.J. Matty. Surgical thyroidectomy has been successfully performed n the dogfish, *Scyllium canicula*, and has been shown to have no sig- ificant effect on the animal's oxygen consumption over a period of ix weeks.

The injection of extracts of dogfish thyroid into adult male white ats results in an increase in the animal's oxygen consumption of the ame order as that produced by mammalian thyroid preparations. The ignificance of these results is discussed in the light of recent investiga- ions of thyroid function in fish.

"Notes on the Growth and Biology of the Prawn, *Spirontocaris illjeborgii* (Danielssen)," by R.B. Pike. Account of nomenclature and listribution, length distribution of samples, growth rate, maturity, breed- ng and fecundity.

Administrative Reports

Canada. Fisheries Research Board of Canada, *Annual Report*, Ottawa,
1953 Ont., Canada. 185 pp. In English.

France. *Annuaire de la marée et de l'armement à la pêche* [Fishing
1954 Industry and Fish Trade Yearbook], René Moreux and Christian Moreux, 190 bd Haussmann, Paris 8. 23rd ed. 1,196 pp. In French.

India. Government of Travancore - Cochin, *Administration Report*
1954 *the Fisheries Department for the Year* 1952/53.

International Commission for the Northwest Atlantic Fisheries, *Annu*
1954 *Proceedings for the Year 1953/54.* Vol. 4. Headquarters
the Commission, Halifax, N.S., Canada. 104 pp. In Englis

International Commission on Whaling, *Fifth Report of the Commissio*
1954 *1953/54*, Office of the Commission, The Fisheries Departmen
3, Whitehall Place, London, S.W.1. 28 pp. In English.

International Labour Organisation, Committee of Experts on Cond
1954 tions of Work of Fishermen, Geneva, Switzerland. *Accide*
Insurance, 70 pp. ; *Articles of Agreement*, 94 pp. ; *General Repo*
29 pp. ; *Medical Examination on Entry and Periodically Ther*
after, 28 pp. ; *Minimum Age of Entry*, 29 pp.

Ireland. *Report on the Sea and Inland Fisheries for the Year* 1953, *in*
1954 *corporating Statistics of the Capture of Salmon, Sea Trout an*
Eels. Government Publications Sale Office, G.P.O. Arcad
Dublin, Ireland. 49 pp. In English. Price : 2*s.* 6*d.*

Scotland. Scottish Marine Biological Association. *Annual Report 195*
1954 *1954*, Marine Station, Millport, Isle of Cumbrae, Scotland.

Union of South Africa. Department of Commerce and Industries, Div
1954 sion of Fisheries, *Twenty-Fourth Annual Report 1952/53.* Su
plement to *Commerce and Industry*, September 1954, pp. 29-6
In English. Price : 6*d.*

U.S.A. Corps of Engineers, U.S. Army, *Annual Report Passage of Fis*
1953 *over Bonneville Dam Columbia River, Oregon and Washingto*
Office of the District Engineer, Portland, Ore., U.S.A. I
English.

U.S.A. University of Miami Marine Laboratory, *Proceedings of th*
1954 *Gulf and Caribbean Fisheries Institute.* Sixth Annual Sessio
Miami Beach, November 1953. Coral Gables, Flo., U.S.A
143 pp. in English.

U.S.A. Washington Department of Fisheries. *63rd Annual Report Yea*
1954 *1953*, State of Washington, U.S.A. 100 pp. In English.

TIPOGRAFIA FAILLI - ROMA